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A CASE OF LIGATURE OF THE ABDOMINAL AORTA JUST BELOW THE DIAPHRAGM, THE PATIENT SURVIVING FOR FORTY-EIGHT DAYS; WITH A PROPOSED INSTRUMENT FOR THE TREATMENT OF ANEURISMS OF THE ABDOMINAL AORTA BY TEMPORARY COMPRESSION.[1]

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Vincent T., aged fifty-two years, married, and a laborer, was admitted to the Jefferson Medical College Hospital under the care of Prof. James C. Wilson, November 8, 1899.

Family History. His father and mother died at about seventy years from unknown causes; one brother is living and well, and one sister died of pneumonia at fifty-seven years; there is no tubercular history.

Personal History. He had measles during childhood; has never had scarlet fever, diphtheria, nor typhoid. He had an attack of left-sided pleurisy twenty years ago, which was followed by a good recovery. There is probably a syphilitic infection.

His present trouble began about two months before admission, when he had an attack of severe pain in the epigastric region, radiating to the back. The pains varied a good deal in their intensity. On admission he had constant pain in the epigastrium, his bowels were constipated, and his appetite poor. The urine was clear, straw-colored; specific gravity 1020; reaction acid; neither albumin nor sugar was present; urea 1.5 per cent. By the microscope there were crystals of oxalate of lime, amorphous urates, a few epithelial cells, no pus, blood, or casts. His radial arteries were not noticeably atheromatous.

Prof. Wilson asked me to see the patient with himself, to consider the question of operative interference.

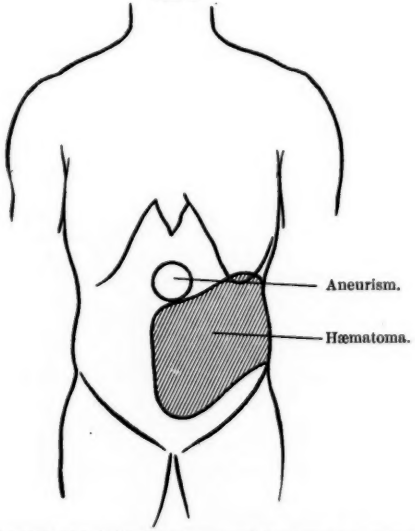
Physical Examination. His general condition is poor. There is a small bed-sore over the sacrum and coccyx. The viscera of the chest

[1] Read at the Thirteenth International Medical Congress in Paris, August, 1900.

are normal, and also the viscera of the abdomen, with the following exception: Half-way between the ensiform cartilage and the umbilicus (Fig. 1) is a tumor nearly 7 cm. in diameter. It is globular, perceptible to the eye, as it slightly raises the anterior abdominal wall. On palpation a distinct expansile pulsation is perceived, and there is a distinct bruit on auscultation. Unfortunately, I did not observe whether the bruit was propagated in the line of the aorta downward. The diagnosis of aneurism was made, and Prof. Wilson and I thought it to be a case suitable for wiring and electricity if, on exploratory operation, it was found practicable to reach it. On proposing this to the patient he rejected operation and left the hospital.

November 22d, five days later, he was brought back to the hospital in the ambulance, complaining of great pain in the left side of the abdo-

FIG. 1.



Site of the aneurism and the hæmatoma resulting from its rupture.

men. Examination showed that the entire left side of the abdomen from the lower border of the ribs to the left iliac region, and extending about 3 cm. to the right of the middle line, was occupied by a large, soft, smooth, elastic tumor. (Fig. 1.) His condition was very alarming; he was almost in collapse. His pulse was very weak, and it seemed as though he could scarcely survive. Under small doses of alcoholic stimulants, rest, and frequent liquid food he gradually recovered, so that he was in a condition for an exploratory operation. Evidently the aneurism had ruptured, and I feared a fatal hemorrhage if nothing was done.

Exploratory Operation, November 29th. An incision was made at the outer border of the left rectus. As soon as the abdominal cavity was opened a mass of almost the same color and consistence of the spleen

appeared in the wound. A few minutes' exploration showed the descending colon to the right of this mass. It was then clear that a large retroperitoneal hemorrhage had taken place from the aneurism, and that the large, dark mass was an immense hæmatoma under the external layer of the mesocolon. This was confirmed by thrusting a grooved director into the mass. I introduced my hand toward the epigastrium, and could seize in the palm of the hand the aneurism, which had not changed its shape or size to any notable extent. That it was connected with the aorta was evident.

In view of the condition of the man, the size of the clot, and the certainty of enormous hemorrhage if I removed the clot, I closed the abdominal wound. During his first stay in the hospital, and for the two days prior to the operation, his temperature had ranged from about 97° to 99° F. The day after the operation the temperature rose to 101.2° F. and then fluctuated from about 99° to 100° F., falling to the normal by December 2, the third day after the operation. The abdominal wound healed without incident, and the man's general condition improved from day to day. Prof. Wilson and I then determined to try the effect of hypodermatic injections of a 2 per cent. solution of gelatin in sterile normal salt solution. Injections were made December 4th, 5th, 11th, and 16th, of 48 c c. each.

No effect followed these injections, and as his condition was certainly growing no better, and he agreed now to a second operation, this was determined upon. Our intention was to wire the sac and use electricity; but the facts found at operation led me to ligate the aorta.

Second Operation. Ligation of the Abdominal Aorta, December 12, 1899. An incision was made in the median line, 8 cm. long, and was finally prolonged up to and alongside of the ensiform cartilage and down to the umbilicus. As soon as I had torn through the omentum in order to reach the aneurism the pancreas presented itself, lying only 2 to 3 cm. posterior to the abdominal wall. The entire pancreas had evidently been lifted up and thrust forward by the aneurism. Passing my hand in above the pancreas, between it and the stomach, I readily found the aorta. On each side of it the pillars of the diaphragm were at once felt. The working space above the aneurism was 5 to 6 cm. There were no evidences of atheroma or of other disease in the aortic wall. In view of the apparent possibility of the ligation of the aorta, I decided to attempt it, as a fatal result was inevitable, if nothing was done. First, with the left forefinger, I tore through the tissues on each side of the aorta, and in doing so distinctly felt some of the fibres of the pillars of the diaphragm give way. I readily separated the vena cava from the aorta, and so had the aorta isolated on both sides. With a long-handled aneurismal or pedicle needle with a large curve to my left I then passed four strands of disinfected floss silk from the left side of the aorta to the right. I passed the needle toward the vena cava rather than from it, because my left forefinger protected the vena cava from injury, and I felt that this was much less dangerous than passing the needle in the opposite direction. Then came the greatest difficulty, namely, the finding the eye of the needle and disengaging the thread. The working space between the aneurism, which was fixed below, and the border of the ribs, stomach, liver, and diaphragm above, was so contracted that though I could feel the point of the aneurism needle I could scarcely get access to it in order to seize

the threads with forceps or other instruments or even to see the threads. Accordingly I made a transverse incision, about 4 cm. long, to the left. This incision did not divide any artery which could be recognized as either a continuation of the internal mammary or superior epigastric. It added, however, less to the ease of the manipulation than I had hoped. I should certainly not recommend it in another case lest it should interfere with the re-establishment of the circulation. Finally, with great difficulty, by energetic retraction of the tissues, I was able to see the thread and disengage it from the needle. I then tied the aorta, one assistant having his hand on the aneurism and another on the left femoral. When tied, pulsation ceased in the femoral, but we were much less certain of its cessation in the anerismal sac. It was very difficult to distinguish between true pulsation in the sac and the push of the blood-current in the aorta above the ligature, which was transmitted to the sac with each beat of the heart. Finally, however, we were convinced that pulsation had ceased in the sac. As soon as the ligature was tied the man's head, face, and neck became deeply congested and almost livid. This lividity gradually subsided in a few hours. In a few minutes after the ligature was tied the aneurismal sac had shrunk to less than one-half its original size.

The following observations were made by Dr. Harbaugh, who gave the ether: "Duration of anæsthesia, one hour and twenty-five minutes; 5 ounces of ether were used. He received once $\frac{1}{100}$ grain of atropine sulphate and, four times, $\frac{1}{20}$ grain of strychnine sulphate; he also received one enema of 2 ounces of black coffee and 1 ounce of whiskey. 2 P.M., anæsthetic begun. 2.10 P.M., pulse 100, weak, and easily compressed; $\frac{1}{20}$ grain strychnine sulphate hypodermatically. 2.30 P.M., $\frac{1}{20}$ grain strychnine sulphate hypodermatically. 2.40 P.M., $\frac{1}{100}$ grain atropine sulphate hypodermatically. 2.50 P.M., pulse 70. 3 P.M., pulse 90; $\frac{1}{20}$ grain strychnine sulphate. 3.10 P.M., ligature applied; pulse rose from 90 to 130. 3.15 P.M., $\frac{1}{20}$ grain strychnine sulphate; enema, coffee, 2 ounces; whiskey, 1 ounce."

During the entire operation the pulse was very irregular, weak, and easily compressed; respiration was regular and normal. Neither the splenic nor the portal vein was seen. No artery was seen. When the hand was first introduced I thought I could feel a large vessel beating above the point where the ligature was afterward applied, but this was probably an error. The abdomen was then flushed out with salt solution and closed. The legs, which were cold, were wrapped in cotton and surrounded with hot-water bags. Sensation was but little disturbed, and motion was not impaired.

December 20*th*, 8.40 P.M. Femoral artery was found to be pulsating very slightly. 22*d*. Aneurismal bruit again slightly perceptible. The legs had regained their natural warmth. 24*th*. An attack of moderately acute cystitis. 25*th*. Superficial stitches removed. 27*th*. Pulsation of the internal mammary and deep epigastric probably felt. 28*th*. The area of the clot on the left side of the abdomen was distinctly smaller.

By January 10, 1900, he was so much improved that he sat up out of bed for two or three days, to relieve the monotony of his prolonged stay in bed and to take pressure off his bed-sores; but I thought it dangerous to allow him to continue any exercise.

By January 28, 1900, the clot on the left side of the abdomen, instead of overlapping the median line by 3 cm, failed to reach the middle line

by 3 cm. The aneurismal bruit and distention were not so marked as before. The bruit could not be heard below the aneurism in the neighborhood of the umbilicus. The bed-sore, which existed when he entered the ward, had been dressed with pure bovinine, and was distinctly improved.

On January 9th, 48 c.c. of gelatin solution were again injected hypodermatically. As 48 c.c. gave him some pain, 24 c.c , which were not painful, were injected on the following dates: January 15th, 16th, 17th, 18th, 19th, 20th, 21st, 23d, 24th, 25th, and February 3d, but as no good result followed they were abandoned. On January 14th the tumor in the abdomen was carefully measured and found to extend from the tenth rib to the level of the anterior superior spine, and failed to reach the middle line by 6 cm.

On January 28th he had a marked chill, his temperature rising to 103° F. at 2 A.M.. At 9 A.M. it had fallen to 99° F. On the 29th at 8 45 P.M. another similar chill and an identical rise of temperature took place, and by the next morning at six the temperature had fallen to 98.6° F. On the 30th the plasmodium of malaria was discovered in his blood The administration of quinine up to 25 grains a day, and then later in diminishing doses, prevented any repetition of the chill.

February 5th the patient complained all the afternoon and evening of pain in the region of the aneurism, radiating to the left groin and knee. His temperature also had risen a little above 100° F. On the 6th he was still doing badly. It was noted by Dr. Snell, the house surgeon, that the aneurism was apparently smaller. At 2 P.M. he rapidly grew weaker, the aneurism pulsated more freely, his pulse was very weak, his lips were blanched, and his expression anxious. Strychnine (gr. $\frac{1}{20}$) was given, and a saline enema with whiskey and external heat applied. At 3.20 P.M. he died.

The amount of urine passed before the operation varied from 19 to 40 ounces; but, as a rule, was small. After the operation he passed, on December 21st and the succeeding days until January 1 (eleven days), the following amounts: 12, 4½, 14, 21, 31, 21, 35, 40, 45, 39, 31 ounces, and after that his usual amount. Unfortunately, I did not examine it for albumin or other pathological changes. The kidneys were found to be normal at the necropsy.

Necropsy. On account of the circumstances of the case it had to be done hurriedly, as his family were clamorous for the body. It was limited to the abdomen and head. Unfortunately, the spinal cord could not be obtained. The necropsy was begun a half-hour after he died by Prof. H. F. Harris, Associate Professor of Pathology, and his report is as follows:

"Body of an emaciated male; skin pale and of a slightly yellowish hue. Mucous membranes likewise pale. Post-mortem rigidity has not begun. Temperature of the body almost that of the living person.

"In the abdominal wall there are three scars, one extending from the tip of the ensiform cartilage to a point just above the umbilicus; it is 1 mm. wide and 12.5 cm. long, and consists entirely of cicatricial tissue. Four centimetres to the left of the umbilicus there is a second scar, which extends from a point just above the umbilicus to the crest of the ilium; it is 17.5 cm. long and entirely healed. Running to the left from a point in the centre of the first scar referred to is a scar 4 cm. in length. It is also thoroughly healed.

"On cutting into the abdominal wall only a very small amount of adipose tissue is found. The muscles are rather pale, otherwise the wall presents no abnormalities. On opening the abdominal cavity great quantities of dark fluid blood and many clots are found. The omentum is adherent to the abdominal wall at the seat of the first scar. Beneath the scar last described several loops of small intestine are adherent to the abdominal wall; there is also a large tumor, which becomes apparent on opening the abdominal wall in this situation.

"The left pleural cavity is found normal on opening the chest. Scattered here and there are a few adhesions (evidently quite old) between the layers of pleura on the right side.

"Lungs are normal.

"On opening the pericardial cavity the lining membrane is found to be normal. Cavity contains 15 c.c. of fluid.

"Left side of the heart firmly contracted; right side empty and exceedingly flabby. Heart is rather small; it is in every way normal.

"Spleen is bound to all neighboring structures by old adhesions. Capsule is thickened, especially on its convex portion. The organ is slightly enlarged and its substance is tougher than normal. Weight, 175 grammes.

"Left adrenal is normal. Left kidney is normal in size and consistency, though perhaps slightly paler than usual. The capsule strips readily. Cortical and medullary portions normal. Weight, 140 grammes.

"The left ureter is pushed greatly forward and inward on account of a large tumor-like mass which occupies the left lumbar region.

"The tissues around the right kidney are intensely ecchymotic, and are much softer.

"Right adrenal is normal. Right kidney resembles in every way its fellow. Weight, 130 grammes.

"Right ureter is normal.

"On opening the bladder the mucosa of its posterior surface is covered by numerous rounded elevations, the largest of which are 1 cm. high and 1 cm. in diameter, the smallest being pinhead-like projections. These elevations are covered by a whitish deposit, which apparently consists of triple phosphates. On section, toward their free ends, these tumors are found to be of a dark, slaty color, but as the base of the tumor is reached this color gradually gives way to a grayish appearance. The tumor substance is well defined from the normal tissue beneath. The tumors toward their bases are encircled by a slight constriction, giving them the appearance of being somewhat pedunculated. The surrounding mucosa is bright red.

"The liver is small, weighing 1150 grammes. Its substance is soft and friable and rather pale in color.

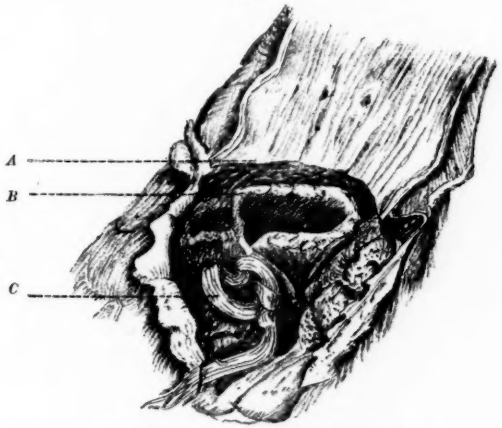
"Pancreas is normal and weighs 118 grammes.

"Gastro-intestinal tract is normal.

"On removing the abdominal aorta this vessel is found to be entirely cut through at the point where it had been ligated, which is just below the diaphragm. (Fig. 2.) From this opening in the vessel blood had infiltrated downward into the tissues beneath the peritoneum, and had finally burst into the peritoneal cavity just over the right kidney. There had evidently been also some oozing of blood from the wound at the place where the vessel was tied. On dissecting further downward, 3 cm. below the point where the vessel is divided, an irregular, rounded

cavity was found on the posterior aspect of the aorta; its greatest diameter, which is longitudinal with the vessel, is exactly 2 cm. and the shortest is 3 mm. less. (Fig. 3.) The edges of this opening in the aorta are perfectly smooth, and are continuous on the inside with the intima of the bloodvessel and on the outside with the sac of the false aneurism about to be described. Just posterior to this opening, and extending 1 cm. upward from its upper margin and 5 cm. downward from its lower edge, is a rounded cavity that is flattened antero-posteriorly. This cavity is evidently the result of the opening in the aorta forming a false aneurism in this situation. The anterior wall of this sac is made up partially by the external coat of the aorta, which becomes continuous with the compact wall of tissue on either side, which forms the remaining part of the anterior boundary of the aneurism. This sac curves backward to the side of the vertebral column and be-

FIG. 2.



Site of ligature of aorta, viewed from in front,

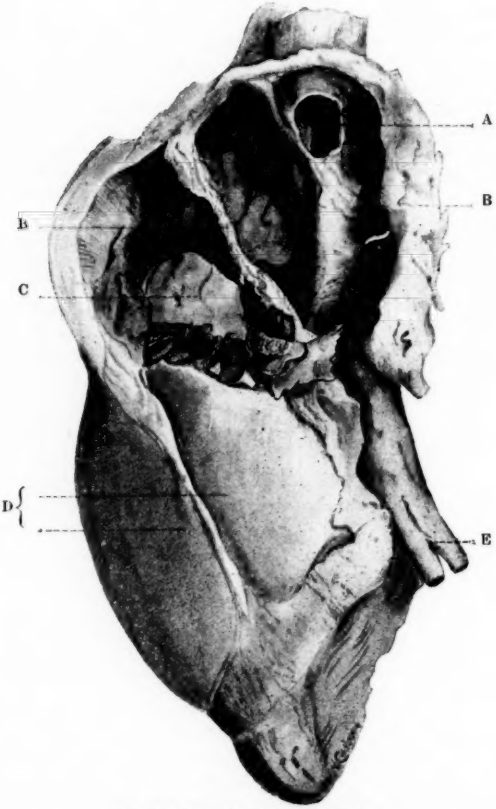
A. Edge of upper portion of the aorta. *B*. Edge of lower portion of the aorta. Between *A* and *B* is the place of ligation, followed by ulceration of the ligature completely through the aorta. *C*. The ligature as found at the necropsy.

comes continuous with the periosteum of the bones composing it. The bodies of the eleventh and twelfth dorsal and first lumbar vertebræ form the remaining part of the posterior part of the sac. The bodies of these vertebræ are deeply eroded, although the intervertebral cartilages are not affected. In all of its diameters, except antero-posteriorly, the exact measurement of which could not be determined, the diameters of this sac are 6 cm.; but as the antero-posterior diameter is but little less than the others it is, therefore, evident that the sac was almost round. The tissue forming the inner wall of the cavity is at all points quite dense—resembling fibrous tissue—and can scarcely be differentiated from the intima of the bloodvessel, with which it communicates. This sac has ruptured on its lower left side; the blood, penetrating into the muscle and tissues back of the peritoneum and infiltrating down to the

brim of the pelvis on the left side, has produced a tumor-like mass 24 cm. long and 6 cm. in diameter at its widest portion.

"It will be observed from the above description that there is no aneurism of the aorta itself, there being merely an opening in the posterior wall. The intima of the bloodvessel both in the region of the opening and above and below is in a remarkably good condition, considering

FIG. 3.



Aorta and aneurism seen from behind.

A. The opening in the aorta. *B, B.* Wall of sac of false aneurism. *C.* Opening where wall of sac ruptured. *D.* Large clot occupying left side of abdomen. *E.* Bifurcation of aorta.

the very extraordinary condition of the lesion just spoken of. There are here and there a few minute areas of what appears to be atheroma, and the intima is perhaps somewhat thickened, and shows a somewhat more irregular surface than normal. There are no clots found in the bloodvessel either above or below the point of ligation, nor were there any changes which indicate the formation of recent thrombi. This is

of much importance, in view of the fact that the vessel was eroded through the point of ligation.

"The dura of the brain appears to be entirely normal. The pacchionian bodies are present to an unusual degree on the surface of the brain. In some of the sulci the pia arachnoid appears to be slightly thicker than usual; this change is not a very marked one. The ventricles of the brain are normal. Substance of the brain is normal. None of the vessels, either of the meninges or the brain substance, appear to be in the slightest degree altered.

"*Microscopical Report.* Specimens from the kidney, liver, spleen, brain, sections of the tumors of the bladder, pieces of the wall of the false aneurism, and specimens from the abdominal aorta at the point where it opened into the false aneurism, from the point at which the vessel was tied, and pieces of the wall both above and below these areas were fixed in Heidenhain's solution, cleared in cedar oil, embedded in paraffin, sectioned, and the sections stained with toluidin blue alone, and with eosin, hæmatoxylin alone and with eosin, hæmatoxylin and picric acid, and by the methods of Weigert for fibrin, Unna for collagenous and elastic tissues, and by the method of Van Gieson.

"On examination the sections of the kidney are found to be practically normal, there being only in a few situations a very slight degree of interstitial change. Further than this no alterations existed.

"On examination but little change is found in the liver. There is, however, a slight degree of atrophy of the liver cells around many of the central veins of the lobules, and taking the place of these cells there are quite a number of lymphoid and plasma cells. There is in and between the liver cells in the vicinity of the alterations just referred to quite an amount of golden-yellow pigment. Around some of the fibrous septa which pass into the liver substance there are found here and there small collections of cells, these resembling in every way those occurring around the central veins of the lobules. The liver cells appear to be normal in other situations.

"Microscopical examination of the spleen shows a very marked thickening of the trabeculæ which traverse the substance of the organ. Around the edges of these trabeculæ, and in many instances lying entirely free in the splenic substance, there are found numerous perfectly typical plasma cells, while in addition there are many cells which, though resembling plasma cells in many particulars, do not exhibit the same affinity for basic dyes that is shown by the true plasma cell; these peculiar cells correspond to what are called by some writers atypic plasma cells. No other alterations of any moment are found.

"Microscopical examination of sections of the brain show the substance and the membrane to be entirely normal.

"Bladder: Sections of the tumors of the bladder prove to be of very unusual interest, inasmuch as they reveal the fact that the neoplasms are myxomata—tumors which are exceedingly rare in the bladder. Around their edges these tumors are covered by almost normal bladder epithelium, but on passing upward toward their apices this coat at some points always becomes detached from the basement membrane and hangs loosely in the interior of the bladder; beyond this point no epithelium is, as a rule, present; but occasionally in one of the depressions, which are quite numerous on the surface of these tumors, a few epithelial cells may be found. In the majority of the tumors no very marked change

is observed in the tissues which are exposed to the contents of the bladder, there being only a mild degree of cellular infiltration along the edges, and always considerable enlargement of the bloodvessels which are here present. In other instances the superficial structures that are uncovered by the epithelium have undergone necrotic change, and may be seen lying above and still attached to the living tissues beneath. In both instances, though especially in the latter, the mass of cells which is collected along the borders of the inflamed tissue presents the characteristic peculiarities of the polymorphonuclear leucocyte, but mixed with them are always a number of lymphoid and plasma cells. Along the edges of the tumor multitudes of bacteria are found. A little deeper down there are much larger collections of lymphoid and plasma cells, the latter being especially large and numerous; they occur in greatest number around the bloodvessels. At this point large, stellate, basophilic bodies are observed, and, becoming more numerous the deeper the tumor is penetrated into, they finally make up quite a large part of the tissues which lie toward the bases of these new-growths. These bodies contain several feebly staining nuclei, with distinct nucleoli, and though exceedingly irregular in form, vary in diameter from about 5 to 15 or 20μ. Their protoplasm gives the iron reaction. They are evidently cells that have become swollen, and within their protoplasm there has been elaborated some substance which is intensely basophilic. Between these bodies there is a delicate stroma consisting of collagenous and elastic tissues. Between the bundles of this tissue are numerous spaces which contain connective-tissue cells, a quantity of a finely granular acidophilic substance, and also quite an amount of fluid. This tissue extends downward into the wall of the bladder only a short distance, but more or less separates the bundles of muscle-fibres in the most superficial portion of the muscular wall of the viscus. As before mentioned, these tumors undoubtedly belong to the class of myxomatous new-growths, but contain a certain amount of fibrous and elastic tissue.

"The inner wall of the aneurism is made up of more or less altered collagenous tissue, in the interstices of which there are breaking-down red blood-cells, a few polymorphonuclear leucocytes, lymphoid, plasma, connective-tissue cells, and quite a number of typical giant-cells, the protoplasm of which is intensely basophilic. The cells in these situations show their usual staining peculiarities, but the connective tissues have become decidedly basophilic. In some situations, in the interspaces between the fibrils of the connective tissue, there is a peculiar, entirely homogeneous substance which appears greenish in the specimens stained with toluidin blue and eosin; this substance frequently entirely surrounds the cells, but does not interfere with their staining reactions. Somewhat deeper the connective tissues begin to react in a normal manner to aniline stains, the number of cells, except the connective tissue ones, becomes gradually less and less, the peculiar homogeneous substance referred to is no longer found, and at a somewhat greater distance the tissues are found to present an entirely normal appearance. It may be mentioned as a rather interesting fact that the connective-tissue cells that lie in this connective tissue are much elongated, and that their long axes are invariably parallel with the lining of the aneurism; this is undoubtedly an effect of pressure.

"On tracing the lining of this aneurism to the opening in the aorta it is found that there is no well-marked point of union between the tissues

composing this and those which make up the wall of this bloodvessel—the tissues gradually merging into each other. As the point is reached where the opening exists it is found that while the superficial tissues of what is now a part of the wall of the aorta show a basophilic reaction, the muscle-fibres which lie at a lower level present that peculiar modified basic reaction which is seen in the granules of mast cells (mucin reaction). As the turn is made into the aorta itself both of these appearances just described gradually give way to those which characterize the normal appearance of this vessel.

"A careful examination of sections of the aorta both above and below this opening shows that an exceedingly small amount of change is present in the vessel. Here and there, however, are found slight thickenings in the intima, due to an increase of fibrous tissue, and, in addition to the cells which are normally present in the part, there are, as might be expected, quite a number of lymphoid and plasma cells. In the muscular coats there are also small areas in which the muscle-fibres present the mucin reaction; further than this no change is found in the vessel.

"Specimens from the aorta taken from the point where it was cut through by the ligature show surprisingly little change. In this situation the edges of the vessel present a ragged, irregular surface, and in the depressions between the more elevated portions small collections of blood are seen. At a distance of about 0.5 mm. from the end of the vessel where cut through, and in its muscular wall, there is quite a collection of lymphoid and plasma cells and polymorphonuclear leucocytes, and the tissues in this area have been to quite a marked degree replaced by them. At one side of this collection of cells there are found a few cocci which stain by Gram's method; in addition there are some forms which have the appearance of short bacilli; but these may be nothing more than several cocci lying close together, which seems not improbable.

"These bacteria are entirely surrounded by the wall of the bloodvessel, and evidently were not present at any other point; this accounts for the fact that cultures made from the vessel and from its contents remained sterile. These bacteria certainly exerted no influence on the cutting through of the aorta by the ligature.

"The tissues around the vessel and in the vicinity of where the ligature was placed show a slight degree of swelling, and in addition there are found here and there small collections of plasma cells and a few lymphoid cells; further than this no change is observed.

"In conclusion, it may be said that while a very slight degree of atheromatous change is undoubtedly present in this aorta, the alterations are not so great as are very commonly found in the vessels of old people in whom there has never been the slightest tendency toward aneurismal dilatation of the vessels, and, therefore, the mechanism of the development of the original aneurism, which must have preceded the false one, is by no means so clear as would be desirable. However, in the absence of any other probable cause, it seems necessary to assume that the condition was the result of a particularly severe patch of atheromatous change occurring only in the situation where the opening in the vessel exists, and where a very small aneurism must have developed before the wall of the artery gave way."

Before making any remarks I add a brief *résumé* of all the recorded cases of ligation of the aorta, including one by Tillaux, done since my own.

CASE I. (Sir Astley Cooper[1]).—A porter, aged thirty-eight years, was admitted to Guy's Hospital, April 9, 1817, for an aneurism of the internal iliac artery, extending both above and below Poupart's ligament. It was, apparently, the result of a violent blow upon the left groin thirteen months prior to admission. Three days later the tumor doubled in size. Compression by a tourniquet was applied. This soon produced a slough, and on June 20th he had an external hemorrhage; again on the 22d, the 24th, and the 25th hemorrhages occurred, the last one being so severe that it seemed as though he would not recover. At 9 P.M. on June 25th the aorta was tied by a transperitoneal operation. The incision was in the linea alba, three inches long, half above and half below the umbilicus. The aorta was tied with a single ligature and the ends left long. Immediately after the operation touch on the right thigh was appreciated as a touch on the foot. The pulse was 144 at the time of operation. By one o'clock in the morning, three hours after the conclusion of the operation, the lower extremities were regaining their heat. Other parts of the body were covered with cold sweat. He was treated with opium and external heat. At noon the next day the temperature of the right leg was 94° F., that of the left 87.5° F. Incontinence of feces set in that evening, and incontinence of urine, of which he had passed almost none, began during the day of the 27th. The left leg was still livid and cold. He gradually sank, and died at 1.18 P.M., having survived the operation forty hours.

The *necropsy* showed no peritonitis, excepting at the edges of the wound, which were glued together. The ligature was applied three-quarters of an inch above the bifurcation. Above the ligature was a clot more than an inch in extent, and below there were two clots extending into both iliac arteries. (Figs. 4 and 5.)

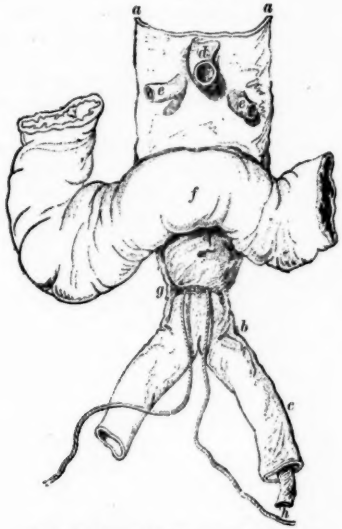
In his remarks on the case Sir Astley says that Mr. Lawrence has proposed that the silk ligature should be cut off close to the knot, but he adds "it has occurred to me that catgut would answer the purpose better," on the ground that as it is an animal ligature it would be more easily absorbed. He then relates the case of a man, aged eighty years, who had a popliteal aneurism and whose artery was tied with catgut, both ends being cut short. The wound was not dressed until the fourth day, and was then found to be completely united.

CASE II. (J. H. James[2]).—A man, aged forty-four years. Case first thought to be hip-joint disease, there being no tumor; but later an enlargement appeared and diagnosis of aneurism made. Operation, June 2, 1829. Ligation of femoral half an inch below Poupart's ligament. On account of extensive sloughing transperitoneal operation on the aorta was resorted to July 5, 1829, 3.30 P.M. Incision in median line. Aneurism needle broke at the wooden handle in consequence of difficulty of inserting it behind the aorta. Great difficulty in passing the ligature around the vessel. When the ligature was tied the patient complained of "deadness in the lower extremities." The ligature was cut close. Great pain in both legs followed, especially on the aneurismal side, and continued until he died, at 7 P.M., three and a half hours after operation.

Necropsy the next morning at ten. The tumor was collapsed. In

[1] Cooper and Travers' Surgical Essays, Parts I. and II., p. 83.
[2] Medico-Chirurgical Transactions, 1830, vol. xvi., Part I.

FIG. 4.



Sir Astley Cooper's case. Anterior view.
a, *a*, aorta; *b*, its bifurcation; *c*, *c*, iliac arteries; *d*, superior mesenteric artery; *e*, *e*, renal arteries; *f*, duodenum; *g*, ligature; *h*, clot in left iliac artery.

FIG. 5.

Sir Astley Cooper's case. Posterior view.
a, *a*, aorta; *b*, its bifurcation; *c*, *c*, iliac arteries; *d*, *d*, duodenum; *e*, ligature; *f*, clot above the ligature; *h*, clot in left iliac artery.

the abdominal cavity there was a considerable quantity of blood, partly coagulated. This may have proceeded from a vessel in the abdominal wall or a vessel in the mesentery scratched by the broken needle. The point of ligation was five lines below the inferior mesenteric and eleven lines above the bifurcation. The sac was filled with laminated clot and some grumous blood. Some diseased spots in the aorta and clots both above and below the ligature. He says: "The great difficulty I experienced in this case arose from the tough investment of the artery, which I could hardly pierce with my nail."

CASE III. (Murray[1]).—A man, aged thirty-three years, admitted to the Civil Hospital, at the Cape of Good Hope, January 22, 1834, with a tumor in the right iliac, hypogastric, and inguinal regions. It probably had existed for eight months. No pulsation was perceptible in the femoral artery. Pain was often very excruciating. The limbs were swollen and flexed. The skin was insensible to touch, especially on the inner part of the thigh; temperature 5° below the opposite one. On the 26th he was seized with agonizing pain, and his general condition was much worse. The leg had become quite cold and insensible. The tumor was evidently on the point of rupture. After friction with stimulating liniments the limb became warm again by the afternoon, but the integuments of the foot were of a bluish color. The only possible operation was deemed a ligature of the aorta.

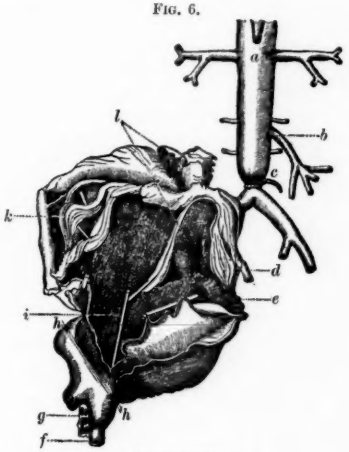
At the time of the operation (11 P.M.) the integuments of the instep and part of the leg were discolored, and the limb was again cold; pulse 120. Operation, January 26, 1834, by candle-light. Extraperitoneal operation. The most difficult part of the operation seems to have been the division of the membranous sheath covering the aorta, which was done chiefly by the finger-nail. At the time of ligation there was no noticeable alteration in the pulse; no congestion of the head. The tightening of the knot did not seem to give the patient any unusual sensation or shock [this was before the introduction of anæsthesia]. His first complaint was that his left leg had become as benumbed and useless as his right, and they had "done him a bad service in laming his good leg." Both ends of the ligature were cut long and hung out of the wound. He was able to move both legs fifteen minutes after the operation. Very soon a painful sensation of distention of the bladder was complained of. One ounce of urine was removed by the catheter, but the sensation was not relieved. His incessant cry for more than an hour was "my bladder will burst; why do you not pump my water off?" By 2.30 P.M. there was violent headache, with great beating of the carotid, while his pulse was scarcely perceptible at the wrist. The livid discoloration in the right leg had increased. At 5 P.M. it is noted that both legs continued "dead cold" in spite of external heat. He died at 9.50 P.M., twenty-three hours after operation.

Necropsy. An injection was thrown into the thoracic aorta and the body examined ten hours after death. There was no peritonitis. The bladder was vesicated on its internal surface and its coats considerably thickened. The left ureter, not injured at the time of operation, was dilated to the size of the little finger. The aorta was tied three to four lines above the bifurcation and one inch below the inferior mesenteric. (Fig. 6.) A small clot of blood existed above the ligature; none below.

[1] London Medical Gazette, 1834, vol. xiv. p. 68, and 1835, vol. xv. p. 6.

The immense aneurismal sac was filled with concentric layers of coagulated lymph and loose coagula of dark, thick, brown sanies. The iliac and psoas muscles were almost putrid, and the sac itself gangrenous in part. Murray points out that he believes the patient did not die from the ligature of the aorta, but "solely by the effect of his disease," as was shown by the gangrene and constitutional symptoms. He points out the fact that in a case of aneurism it is doubtful whether the operation will ever succeed, as the patient "must be so far advanced in danger before he could with propriety be advised to submit to a remedy attended with such imminent risk." He adds, however, that very possibly in cases of wound it would have a much better chance of success.

FIG. 6.



Murray's case.

a, aorta; *b*, inferior mesenteric artery; *c*, ligature on the aorta; *d*, right internal iliac artery; *e*, probe in external iliac artery (upper end); *f*, femoral artery; *g*, crural nerve: *h*, *h*, imaginary line representing Poupart's ligament; *i*, probe in external iliac artery (lower end); *k*, layers of sac held open by quills; *l*, between these two points gangrene had commenced.

CASE IV. (Monteiro[1]).—A man, aged thirty-one years, in perfect health. In July, 1842, after a long horseback ride, he began to feel excessive pain in the right groin. On examination he felt a tumor. The tumor rapidly increased and the pain became more severe, so that he consulted Monteiro on July 28th. A diagnosis of aneurism of the external and common iliac artery was made. Operation, August 5, 1842, 2 P.M. Extraperitoneal operation. One end of the ligature was left long. The operation lasted an hour and twenty minutes. The legs were cold; patient showed slight sweating and dyspnœa. By 6 P.M. the legs were no longer cold, but even warmer than before the operation. Thirst was intense, and the dyspnœa was less pronounced. On the third day the pulse was perceived in the femorals. He made a very excellent operative recovery. At the end of a week pus began to escape

[1] Rev. Méd.-Chir., 1852, vol. xi., p. 147; Lancet, 1842, vol. i., p. 334; and Schmidt's Jahrbüch. 1843, vol. xxxvii., p. 85, and 1852, vol. lxxv., p. 337.

from the wound. On August 14th there was hemorrhage at the point where the ligature protruded. This was followed by a number of hemorrhages. At 10 A.M., August 16th, he died, as a result of the repeated hemorrhages, ten days and twenty hours after operation.

Necropsy twenty-five hours after death. The wound was entirely closed except where the ligature protruded. The aorta was tied four lines from its bifurcation and one inch below the inferior mesenteric. The tumor contained nearly six pounds of coagulated blood, some of it laminated. Below the point of ligature there were some clots; above it there were none. The clots in the inferior portion were, however, small and incompletely obliterated the vessel. The knot of the ligature had perforated the aorta.

CASE V. (South).[1]—June 21, 1856, 2 P.M. A man, aged twenty-eight years. Point of ligation a little above the bifurcation for a large aneurism of the right external and common iliac arteries. The aneurism rose above the umbilicus nearly to the cartilages of the ribs. Pulsation was felt with great difficulty. Distinct bruit by stethoscope. Sensation was lost in all of the right leg from pressure on the nerves. Extraperitoneal operation. The ligature was applied two lines above the bifurcation. This was the first operation under an anæsthetic. He died June 23d, 9 A.M., forty-three hours after operation.

Necropsy. The tumor was found to be a diffuse aneurism arising from the iliac artery.

CASE VI. (McGuire).[2]—Aneurism of external iliac. A man (negro), aged thirty years, while chopping wood, felt something give way in the lower abdomen a week before admission to the hospital. The tumor, about the size of a goose-egg, was in the left iliac and hypogastric regions. The pain was severe and increasing. Compression of aorta at intervals throughout the day and night of March 26th. This could be borne only for a few minutes at long intervals. After two or three hours the pain was so great that it had to be abandoned. Diarrhœa and fever; great tenderness and heat in the tumor. Operation, March 30th, 1 P.M. An attempt was made to ligate the common iliac. Extraperitoneal operation. Collateral circulation was already established, so that a large number of vessels required ligature. The condition found led McGuire to tie the aorta. In order to reach the aorta the tumor was caught between the finger and thumb; but in spite of delicate handling the sac suddenly burst, and a profuse discharge of blood took place. The finger at once placed upon the aorta an inch above the tumor completely arrested the hemorrhage until an assistant had surrounded the vessel with a ligature and tied it. About one pint of blood was lost. In a few minutes after being placed in bed, the body, which had been cold, became warm. At 5 P.M. he complained of numbness in the legs. At 6 P.M. one ounce of urine was removed by catheter. 7 P.M., sleeping quietly; lower extremities warm; skin pleasant. 10.30 P.M., restless; by midnight the pulse could not be measured, and he died at 12.30 A.M., eleven and a half hours after operation.

Necropsy twelve hours after death. No blood in the abdomen. The aneurism involved the aorta from the origin of the inferior mesenteric to the bifurcation and the right common iliac to its division into the external and internal and the left common and external iliacs. The

[1] Lancet, 1856, vol. ii., pp. 47 and 222.

[2] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1868, vol. lvi. (N. S.), p. 415.

ligature was at the origin of the inferior mesenteric, and included the left ureter, which was deeply embedded in the cellular structure of the aneurism. It was difficult, even at the necropsy, to dissect the ureter from the wall of the sac without opening the cavity of the aneurism.

CASE VII. (Watson[1]).—Operation, August 6, 1869. Common iliac had been tied antiseptically nine weeks previous with catgut. Secondary hemorrhage followed, and the aorta was tied by transperitoneal operation with a silk ligature half an inch above the bifurcation. The external and internal iliac arteries on the diseased side were also tied. The patient did well for forty-eight hours, but began to sink after the sixtieth hour, and died sixty-five hours after operation.

CASE VIII. (Stokes[2]).—A man, aged fifty years, accustomed to carrying heavy weights, temperate in habit, and never had suffered from any constitutional disease. Three months before, March 4, 1869, when he was admitted to the hospital, a tumor was first noticed in the right groin. A diffused iliofemoral aneurism was diagnosticated two months later. The tumor occupied the right iliac and upper femoral regions, extending upward to within an inch of the umbilicus. Pulsation, fremitus, and loud bruit were present. Pressure was attempted, but the patient could not bear it. Operation, March 8th, 11.15 A.M., under chloroform. Extraperitoneal operation. The "chief difficulty in the operation," he states, was the separation of the peritoneum from the transversalis fascia. There was great difficulty from distention of the intestines. A Lüer's needle was passed around the aorta just above the bifurcation, and attached to the ligature was a piece of silver wire, which was then drawn around the aorta. The ends of this wire were then seized in Mr. Porter's artery compressor and traction made on them until all pulsation and bruit had ceased in the artery. The ends of the wire were then secured to the ring of the clamp and the wound closed. Both legs were bandaged with flannel. The operation was almost bloodless. Hot-water bottles were tied to his feet and brandy and water given internally. The operation was concluded at 11.15 A.M. Fifteen minutes after the conclusion of the operation the pulse was 125, the color of the lips was good, and the temperature of the right leg and foot was lower than the left; no paralysis whatever; marked restlessness. Immediately after the operation he complained of paroxysmal pain in the ball of the great toe and sole of the same foot. At 2.30 P.M. the temperature in the left extremity was very good; right greatly improved. 9 P.M. pulsation of the left femoral had returned; in the tumor no pulsation or bruit. He died at midnight, about thirteen hours after operation.

Necropsy the next day. Aneurism of the right common and external iliacs and femoral. (Fig. 7.) The bone was partly eroded. In the tumor there was a considerable amount of coagulated blood and some recently deposited fibrin. The instrument was removed with the greatest facility. It was found that not the slightest injury had been done to any of the coats of the aorta. Before opening the aorta the point of compression was found to be water-tight. He calls attention to the fact that the collateral circulation can be established in a very few hours, and also that speedy consolidation of the contents of an enor-

[1] British Medical Journal, 1869, vol. ii., p. 216.
[2] Dublin Quarterly Journal, 1869, vol. xlviii., p. 1.

mously diffused iliofemoral aneurism can take place after occlusion of the aorta. The death in his case was caused by the shock of the operation in a person with fatty degeneration of the heart.

FIG. 7.

Stokes' case.

CASE IX. (Czerny[1]).—A soldier, aged twenty-seven years, on August 4, 1870, was wounded four finger-breadths below the left Poupart's ligament. The thigh bone was not fractured. On the 11th a severe hemorrhage took place. Ligature of the femoral artery both above and below the profunda. On the 13th there was loss of sensation in the left foot. This yielded to hot applications and alcoholic stimulants. On the 19th another severe bleeding at the point where the artery was ligated. The lower ligature had cut through. The common iliac artery was then ligated after failure to secure the bleeding-point. The hemorrhage from the femoral became less, but was not arrested. Renewed attempts to tie the profunda resulted in failure. Extraperitoneal operation on August 19th at 9 A.M. Believing that, as he had not seen the

[1] "Bericht ueber die in Weissenberg behandelten Verwundeten." Wiener medicinische Wochenschrift, 1870, p. 1402, and 1871, p. 103.

division of the artery, he had probably ligated the external iliac and not the common iliac, he carried his incision a little further up, stripped off some more of the peritoneum, and found, about three-quarters of an inch higher, the division of the artery into two parts. "Although the thought came to me for a moment that the vessel which had been tied might be the aorta, this idea seemed so improbable that I did not examine the pulsation of the right femoral." One end of each of the two ligatures was cut short and the other brought out of the wound. In the afternoon his condition was hopeful; the pulse was 136; the injured leg, however, did not again become warm. The next morning at eight o'clock the left thigh was greatly swollen, discolored, and the whole extremity cold and dead; the right warmer, movable, and sensible. At 12 M. he died, twenty-seven hours after the beginning of the operation.

Necropsy. No peritonitis. [No mention is made of any antiseptics.] The two abdominal ligatures were found to be: the first, just above the bifurcation of the common iliac; the other on the aorta itself. (Fig. 8.) The ligature on the aorta was impermeable to water. At the ligature of the aorta there was only a peripheral thrombus. Death took place from acute sepsis and hemorrhage. The collateral circulation must have been re-established very soon, as in the right leg there was no visible disturbance of the circulation.

FIG. 8.

Czerny's first case.

a, aorta; b, inferior mesenteric artery; c, middle sacral artery; d, common iliac artery; e, external iliac artery; f, profunda femoris artery.

CASE X. (Czerny[1]).—A man, aged fifty years. Large tumor of the left kidney. Operation, January 19, 1879. Cœliotomy. The outer layer of the descending mesocolon was divided and blunt dissection begun. It was soon found that the soft tumor mass had broken through not only the capsule, but the inner layer of the mesocolon. Very profuse bleeding occurred, which could be controlled only by temporary compression of the aorta. As soon as this was relaxed the hemorrhage began again. Accordingly the aorta was tied and the hemorrhage ceased. [The paper does not state whether the tumor was removed or the operation abandoned.] Two hours after the closure of the abdominal wound anæs-

[1] "Ueber Nierenexstirpation." Centralblatt für Chirurgie, 1879, vol. vi., p. 737.

thesia and paralysis of the lower extremities set in, and ten hours after the operation he died.

Necropsy. The renal artery was torn close to its entrance into the tumor. The ligature around the aorta lay diagonally between the two renal arteries, so that the right renal was not obstructed, but the left was entirely closed.

CASE XI. (Milton[1]).—An Egyptian, aged forty-five years, admitted to the hospital July, 1890. For sixteen months he had had a pulsating tumor in the abdomen, with severe paroxysmal pain. He had had syphilis, but never received any injury. The tumor was the size of an orange, and lay a little above the umbilicus. An operation was planned by Mr. Milton as follows: "To incise the abdominal walls for about five inches in the middle of the linea alba, to expose and incise the peritoneum covering the aorta one inch above the aneurism, separate the aorta from the vein, and then pass a blunt director on either side of the vertebræ, and to force it gradually backward through the tissues until its point could be cut down on in the back; then to make a similar passage on the other side; then to pass a small drainage-tube along the two channels made by the director, forming a loop across the aorta, the two ends of the tube presenting in the back on either side of the vertebral column—the tube being in position, to close the peritoneum over it with catgut sutures, and finally to completely close the abdominal incision. The idea was to leave the patient a few days, and then to compress the aorta against the vertebral column by traction on the two ends of the drainage-tube. The amount of pressure to be applied and the period of its application were to be regulated by the effect produced on the patient." Before this could be done, however, July 3d, the patient awoke with severe pain, and the aneurism evidently had suddenly ruptured. The rounded tumor could no longer be differentiated, but formed part of a pulsating mass extending from the umbilicus into the whole left hypochondrium. The aorta was compressed until it was ligated eight lines above the origin of the aneurism. The effused blood was retroperitoneal. Duration of operation but twelve minutes. Death took place, at the end of twenty-four hours, of anæmia and shock. He had complained of intense pain and tingling in both legs up to the time of his death. Thirteen ounces of urine, free from albumin or blood, were passed.

Necropsy. Aneurism purely aortic; lower limit three-quarters of an inch above the bifurcation; upper limit an inch and a half below the renal arteries, both of which were above the point of ligation. Four pounds of blood were found behind the peritoneum. All organs were anæmic, but otherwise healthy. Kidneys normal.

CASE XII. is the case reported in this paper.

CASE XIII. (Tillaux[2]).—A man, aged fifty-six years, who had suffered with an aneurism of the left iliac for a year. On January 20, 1900, it ruptured and produced a diffuse aneurism as large as an adult head and reached almost to the umbilicus. The common iliac, as was supposed, was tied as high as possible with a silk thread by the transperitoneal route. There was no pain nor circulatory disturbance afterward; no alteration of the sensibility; the temperature on the left side was 35.4° (C.), and on the right side it was 34.6° (C). After several

[1] Lancet, 1891, vol. i., p. 85. [2] Bull. et Mém. Soc. de Chir., Paris, May 8, 1900, p. 473.

days the tumor gradually increased in size, with a return of slight pulsation. He gradually grew thinner and showed evidence of venous congestion, with retention of urine. He died thirty-nine days after the ligation. The *necropsy* showed that the later phenomena were due to thrombosis of the femoral vein. The ligature, instead of being placed on the common iliac, as had been supposed, had been placed on the aorta immediately above the bifurcation. Nothing is said in this preliminary report as to the condition of the aorta above and below the point of ligation, as to the circulation in the other leg, the condition of the kidneys, or the spinal cord; but Prof. Tillaux has kindly informed me that there was no ulceration at the point of ligature. The aorta was not completely obstructed by the ligature, as a grooved director could be passed.

REMARKS. The remarks that I have to make can be best divided into (1) the remarks on the case herewith reported and (2) on the general subject of the cure of aortic or iliac aneurism by ligation of the aorta or other means.

1. *Remarks on the Present Case.* The first question that presented itself to me was whether the ligature had not slipped and failed wholly to occlude the aorta, as actually occurred in the able hands of Prof. Tillaux. This was especially suggested to me by the large loop which the ligature showed, as revealed by the necropsy (Fig. 2). In order to determine this positively I removed the loop of the ligature from the specimen and stretched it between two pins. The distance between the two pins was 21 mm. I then obtained a fresh aorta and ligated that as tightly as I could, and on removing the loop found that it measured 19 mm. between the two pins. This convinced me that the ligature did really occlude the aorta, for on comparing the fresh aorta with the specimen I found that the aorta from my patient was somewhat wider than the fresh one.

Additional evidence—the absence of pulsation in the femorals after the operation was concluded, and its *gradual* return, the absence of pulsation in the aneurism, which, as described, was somewhat difficult at first to determine positively, and the diminution in the size of the aneurismal sac—convinced me that the aorta was entirely occluded. It is also to be noted that when I tied the fresh specimen it did not pucker conically at the site of the ligature, but was folded over upon itself. This would increase remarkably the size of the loop.

The site of the ligation in reference to the branches of the aorta could not be determined with absolute accuracy from the specimen when I first saw it. It was certainly applied just below the diaphragm, as the pillars of the diaphragm were recognized at the time of operation. Whether above or below the cœliac axis was not quite certain, but it was surely applied above the renal and the mesenteric arteries. In view of the position of the ligature, it is remarkable that the post-

mortem showed no changes in the kidneys, and that the amount of urine passed, though much diminished in the first few days following the operation, was not much less than often follows any other operation.

I regretted very much that the necessary haste with which the post-mortem was made prevented the removal of the spinal cord and its microscopical examination. So far, however, as the clinical symptoms went, there was no marked change in either sensation or motion. The cutting off of the circulation produced a coldness in both lower extremities, which, however, soon passed away, and later the man was able not only to move his legs, but to get out of bed and even to walk with his usual strength. One very marked symptom was observed immediately after the ligation of the aorta—the very deep congestion of the upper portion of the body. This explained to me more forcibly than I had ever appreciated before the enormous dilating force of the blood-current and the means by which the collateral circulation is established.

In only three of the cases reported is the time given at which the femoral pulsation was observed to be re-established. In Stokes' case (VIII.) the femoral pulse was observed in ten hours; in Monteiro's case (IV.) on the third day, and in my own it was observed a little over five hours after the conclusion of the operation. Its early re-establishment, it seems to me, was probably due to the partial collateral circulation already in existence by reason of the aneurism. In Czerny's first case (IX.) the collateral circulation, as he says, must have been re-established very soon, as there was no visible disturbance of the circulation in the other leg. In 1864, in a case of ligation of the common carotid, I observed the re-establishment of the temporal pulse on the side of the ligation in five and a half hours after the operation.[1]

The experiments upon animals by Sonnenburg[2] present some very remarkable results in reference to the collateral circulation after ligation of the aorta. First, a manometer was placed in the central end of the femoral artery, and the aorta was then compressed and finally tied. When digital compression was applied, or when the ligature was tightened, the blood-pressure fell gradually, but did not reach the zero. When the ligature was permanently tied the pressure *fell from* 110 *mm. of mercury to only* 66 *mm., but after* 300 *seconds began to rise again, and after* 700 *seconds pulsation was perceptible.* The manometer was then placed in the peripheral end of the femoral and the aorta tied. The pressure again fell, but not so quickly as in the first instance, and the pulse also returned, but at what time is not mentioned.

Kast[3] also reports some experiments on animals in which he placed a manometer in the central end of the femoral of a goat. As soon as

[1] The American Journal of the Medical Sciences, July, 1864.
[2] Centralblatt für Chirurgie, 1876, p. 689.
[3] Deutsche Zeitschrift für Chirurgie, 1880, vol. xii., p. 405.

the aorta was tied the pressure fell from 20 mm. not entirely to zero, and *after only two or three seconds rose to* 17 *mm.*

2. *Remarks on the Cure of Aortic Aneurism by Ligation of the Aorta or Other Means.* On reviewing the thirteen cases of actual deligation of the aorta in man in connection with the numerous experiments on animals which have been made on this subject, three propositions, it seemed to me, are well established.

(1) The human subject can survive after ligation of the aorta without serious mischief. Ten of the cases have died very shortly after the operation, but three of them have survived sufficiently long to establish the truth of this proposition. Monteiro's case survived ten days and twenty hours; Tillaux's case survived thirty-nine days, and my own case survived forty-eight days. These show distinctly that the collateral circulation can be established sufficiently early to preserve the lower limbs from gangrene and the cord from such changes as will produce a permanent paralysis.

FIG. 9.

To illustrate the expansile tug on the ligature, necessarily causing its ulceration through the walls of the aorta.

No certain conclusions can be drawn as to the effect of the ligature on the vessel in Tillaux's case, since the lumen of the vessel was not entirely closed, but Monteiro's case and my own show that with the ordinary ligature, whether single or multiple, death will almost certainly result from the cutting through of the ligature and secondary hemorrhage. The diagram (Fig. 9) shows the reason for this.

The aorta is very elastic. With each pulsation there must be marked dilatation of the vessels above the ligature, and this constant tugging must eventually result, in my opinion, in all cases in ultimate ulcerative absorption, rupture, and death.

I had in mind at first the substitution of a broad, flat band which would occlude the aorta over a considerable space, and thus mechanically avoid the cutting action of a ligature. A serious objection to this would be that the knot in any band, such as a piece of tape or a silk ribbon sufficiently broad to attain the object in view, would be very bulky, and instead of being absorbed would almost certainly give rise to trouble. This led me to devise the instrument which is described below.

We can also appeal for instruction to the considerable number of cases of occlusion of the aorta by either a thrombus or an embolus, referred to by Welch.[1] In this exhaustive paper Welch has collected

[1] Allbutt's System of Medicine, American edition, vol. vii., p. 273.

fifty-nine cases of occlusion of the aorta. Fifty-six of these were followed by death, very commonly from gangrene. Even if the patient, therefore, should survive the shock of the operation, the chances of recovery would be but small.

(2) The treatment of aortic aneurism by temporary compression of the aorta by means of a tourniquet has given what may justly be called excellent results, especially as compared with ligation. This method, as is well known, was devised in 1864 by Murray,[1] of Newcastle-on-Tyne, who, for the first time, tried instrumental compression, and with entire success. The pressure was made through the abdominal wall by a tourniquet, first on April 16th for two hours, and on a second occasion, April 19th, for five hours, the patient being continuously under chloroform on both occasions. The circulation was not completely and permanently suspended except for the last hour of the second attempt. In Ashhurst's *International Encyclopædia of Surgery*, vol. ii., p. 928, which was published in 1889, Barwell states that ten cases had been reported up to that time, of which five were successful, four died, and in one case no cure was effected. Pressure was kept up in some of the cases for five, ten, and ten and a half hours. The cases that resulted fatally died as a result of *bruising of the intestines*, which could not be displaced from underneath the tourniquet.

I have not sought in the literature on the subject for any additional cases since that date, but the presumption would be that the mortality-rate would be about the same.

(3) The third proposition is that in suitable cases of aortic or iliac aneurism, in view of the safety from infection which our modern antiseptic methods give us, the abdomen should be opened and an instrument applied to the aorta which would suitably compress it, not with a view to the permanent obliteration of its calibre, but, following Murray's method, for a temporarily complete or almost complete occlusion of the lumen of the aorta. By its application through an incision injury to the intestines could be avoided with absolute certainty. The instrument should be so constructed that the compression could be regulated, relaxed, and renewed at pleasure; and, finally, when consolidation of the aneurism has been effected, the instrument could then be withdrawn and the abdominal wound closed.

In Milton's case the very ingenious plan which he devised, but was prevented from employing, was as follows: That the abdomen should be opened, the aorta isolated, and the two ends of a drainage-tube passing over and in front of the aorta should make their exit through two openings on either side of the spine. The two ends could then be tied and the pressure relaxed or increased as desired, the tube being

[1] Medico-Chirurgical Transactions, vol. xlvii., p. 187; Lancet, February 8, 1873, p. 193.

removed when the object had been attained. The two most serious objections which seem to me to lie against this plan are, first, that structures other than the aorta would be liable to injury, especially the thoracic duct, and, secondly, the possibility of infection and the more extensive injury, neither of which, however, need be taken too seriously.

The instrument that I have devised avoids the danger just alluded to —of pressure on the thoracic duct—and requires only the opening of the abdomen and its application to the vessel. It consists of two parts (Fig. 10): First, a shank with a horizontal plate, which passes at right angles to the shank behind the aorta. The aortic surface is slightly roughened, in order to prevent slipping. Secondly, a second shank, with another horizontal plate, which can be introduced separately and fastened to the shank of the first piece by slipping the narrowed portion under the two projecting teeth of the first shank. This upper horizontal plate is also slightly ribbed on its under surface and provided with a lip which overlaps the lower horizontal plate, the object of the lip being to prevent the slipping of the aorta from the grasp of the blades.

FIG. 10.

I have measured the human aorta, and find that when flattened out it measures about 36 mm. transversely. This would give the proper measurement for the width of the plates. In order to make the narrowing of the aorta a conical or gradual one, instead of the abrupt narrowing caused by the ligature, the sides of the upper horizontal plate shelve gently upward. For application to the human subject the length of the plates should be about 15 mm. in the horizontal portion, the shelving portion at the upper and lower border being about 5 mm. each. The length of the shanks or handles would be greater or less in accordance with the build of each patient. In a very stout person they would have to be much longer than in a thin patient. The instrument can be introduced either as a whole, or, probably more readily, in two parts, which are then fastened together by passing the narrow portion of the handle of the upper blade into the grasp of the two prongs or teeth on the handle of the lower blade. By means of the screw at the upper end the upper blade is now gradually approximated to the lower, and when an assistant, with his finger on the femoral artery, finds that the pulsation has disappeared, occlusion of the aorta would be complete. By means of the little crossbar and by unscrewing the screw the upper blade can be retracted to any desired extent. By this manipulation it is evident that the circulation can be absolutely arrested or can be reduced to any degree that is desired. By this means Murray's method of temporary compression can be adapted to the aorta for any length

of time desired, in accordance with the effect of the anæsthetic, the general condition of the patient, and the effect upon the aneurism. Indeed, I am not at all sure that the patient would have to be anæsthetized during the entire sitting. Very possibly when the aorta has been occluded the anæsthetic might possibly be withdrawn and only renewed when the instrument is to be removed. Experience may show that even this is not required. With the modern antiseptic methods I believe it would be possible to retain the instrument in position for two or three days and reapply the pressure at any time, removing the instrument entirely when the attempt has been either successful or would be best abandoned. In removing it, it might be removed as a whole, or, if desired, in two parts.

EXPERIMENTS UPON ANIMALS WITH THE INSTRUMENTS JUST DESCRIBED.

At my request Dr. J. C. Keeler performed the following experiments upon some dogs, in order to test this instrument. Female dogs were selected, so that the abdominal bandages might not be soiled with the urine. All the usual antiseptic care was taken, and each dog, after recovery from the chloroform, if there were any symptoms of pain, received suitable doses of morphine to relieve her. In each case, unless otherwise stated, the aorta was clamped just below the renal artery.

Experiment I. March 10, 1900, 4 P.M., small dog. The clamp was placed in two separate pieces on the aorta and tightened until complete obliteration of the femoral pulse was observed. The hind legs were found to be paralyzed as soon as the dog recovered from the anæsthetic. She was, therefore, slung with bandages. Respiration soon became rapid and shallow; all nourishment was refused, and six hours after the operation death ensued. The post-mortem showed the clamp in place 2.5 cm. below the renal arteries; the lungs were congested.

Experiment II. March 19, 1900, 3 P.M., large dog. The clamp was placed on the aorta as a whole instead of in separate pieces, and was then tightened until the femoral pulse had ceased. Six hours and a half later the femorals were pulsating strongly, and it was found that the clamp had slipped from the aorta. The clamp accordingly was removed in two parts and the wound closed. For two days the dog was partially paralyzed in the hind legs, but showed no discomfort, and soon was entirely restored to health. The slipping was due to the fact that the upper blade which clamped the artery had not a sufficiently long curved lip to prevent it from slipping. The lip was then slightly lengthened and the following two experiments performed with the modified instrument. I might add also that Dr. Keeler and also Mr. Schneyder, the instrument maker, had suggested several other minor improvements.

Experiment III. April 9, 1900, 3 P.M. The same dog as in Experiment II. The aorta and the part involved in the prior operation were found firmly bound down by adhesions. Accordingly the clamp was adjusted as a whole just above the bifurcation of the aorta. The aorta

was then compressed so as to obliterate the pulsation of the femorals. Twenty-four hours after the operation distinct pulsation could be felt in the femorals. How much earlier it had been present could not be determined. Forty-three hours later the clamp was tightened so as to obliterate the pulsation, and it remained in place until the one hundred and tenth hour. For the first four hours paralysis of the hind legs was noticed; after that time she walked with a tottering gait. Food was heartily taken, and everything looked toward a speedy and complete recovery. The clamp, however, became entangled in the bandages as an attempt was about to be made to remove it, the aorta was torn, and death ensued immediately.

[In all probability the minor effects following the later entire occlusion were due to the establishment of the collateral circulation by the partial occlusion of the aorta at the first attempt.]

Experiment IV. April 20, 1900, 2.15 P.M. The clamp was placed in position in two parts and tightened so as to obliterate the femoral pulsation. Paralysis of the hind legs immediately followed. Three and a half hours later the clamps were removed, one blade at a time, the pulsation re-established, and the paralysis disappeared.

The conclusions from these operations are: (1) that in dogs paralysis of the hind legs follows complete obliteration of the aortic stream; (2) that the paralyzed parts may regain their entire health even after forty-eight hours' compression; (3) that three and a half hours of compression will not interfere with the complete restoration of the paralysis; (4) that at least after twenty-four hours, and possibly less, the collateral circulation may re-establish the continuity of the circulation; (5) that the aorta may be clamped in the dog for one hundred and ten hours, and yet the collateral circulation be established sufficiently to nourish the posterior extremities; (6) that the clamp can be placed on the aorta, at least in the dog, either in separate parts or as a whole, and (7) that it can be readily removed without injury to the aorta.

GRANULAR DEGENERATION OF THE ERYTHROCYTES, AND ITS SIGNIFICANCE IN CLINICAL PATHOLOGY.

By Prof. Dr. Ernst Grawitz,
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In making clinical blood examinations, my attention has for a year past been directed toward certain morphological changes in the red blood-cells, which, while easy to demonstrate, are yet of considerable interest in diagnosis.

It is well known that the changes which we find most frequently in the red blood-corpuscles, such as macrocytosis, microcytosis, polychromatophilia, and the presence of nuclei in the red cells have generally no single significance; that is, without further knowledge we cannot determine whether these changes are regenerative or degenerative in character. Poikilocytes alone can safely be considered to be products of degeneration and to show an anæmic condition of the blood.

Under these circumstances it is an interesting fact that we have recently learned to recognize another change in the red cells, the appearance of fine granules in the corpuscles upon the addition of a basic dye. This change is undoubtedly to be considered degenerative.

To demonstrate these granules, specimens are thus prepared: the drop of blood, spread in the usual way in a very fine film upon the cover-glass, is allowed to dry in the air; it is then fixed in 99 per cent. alcohol. After this a basic dye, such as methyl-blue or hæmatoxylin, is used, either alone or in combination with an acid counter-stain. In the latter case an eosin hæmatoxylin or an eosin methyl-blue solution is used.

The affected red cells appear in these specimens full of very fine dark-blue points; these granules are found not only in the normal cells, the so-called normocytes, but also in the megalocytes, microcytes and poikilocytes, and they occur not infrequently in the nucleated red corpuscles. As a result of my clinical observations I have called this alteration "granular degeneration" of the red corpuscles, as it is recognized only in those morbid processes in which, with further knowledge of the cases, a degeneration of the blood-cells may be assumed to be present. In the few cases which have grown worse this change in the cells has increased; with improvement it grows less, and when a case is cured it wholly disappears.

This granular degeneration of the red cells is not to be confounded with the products of the dissolution of the nucleus, which are occasionally observed in nucleated red corpuscles in the circulation, as, for instance, in karyolysis, when the residue of the nucleus appears plainly to be recognized as tiny, coarse, round particles in the blood-corpuscles. But the morphological finding alone, with one examination, permits the differentiation of the two processes with certainty, for karyolysis of the red blood-corpuscle, which is often to be seen in bone-marrow, appears to be extraordinarily rare in blood-cells in circulation, and when seen occurs only in high-grade anæmic conditions; while, on the contrary, in severe anæmia, granular degeneration is wanting in the erythrocytes of the bone-marrow, and occurs only in the circulating blood-cells.

From my experience, so far, I believe that granular degeneration takes place in the red cells of the circulating blood, through the influence of different blood poisons. In this way a peculiar reaction of the cell protoplasm is produced. This can be brought about by differ-

ent causes, and it follows from this that the occurrence of this sign of degeneration in the blood is of no simple significance. It admits of but one general conclusion: that it is the result of the action of deleterious substances upon the blood.

In the following cases I shall consider the most important processes in which granular degeneration plays an important rôle; but we must not forget that further experiments in clinical hæmatology may bring to light other more interesting particulars:

1. In chronic lead-poisoning the degenerated red cells occur in the blood in great numbers, and quite uniformly. In more than thirty cases of saturnism we have regularly found these granule cells, each time in direct proportion to the gravity of the disease. In no illness, so far as I can yet judge, do these granule cells play so great a diagnostic and prognostic rôle as in lead-poisoning.

The striking pallor of those affected with lead-poisoning has for a long time been very well known, yet the most thorough examination of the blood, the determination of its specific gravity, its dried residue, the number of blood-corpuscles, and their morphological changes, permit the recognition of no abnormality; so that up to a short time ago I had myself been of the opinion that the anæmia of the lead-worker was only apparent, the deception being brought about by the contraction of the bloodvessels of the body through the influence of the lead upon their muscular walls.

Since our recent experiments this view is no longer tenable, for the presence of great numbers of granule cells in these patients shows that the lead exercises a direct deleterious influence upon the blood-cells, acting, therefore, as a true anæmia producer.

My assistant, Dr. Hamel,[1] has published the detailed results of our research on this subject. Of these results I would mention here, that often the granule cells are seen in the blood of those affected with lead-poisoning, even when no other morphological changes can be found in the blood, and, what is of still greater importance, when absolutely no other symptom of lead-poisoning is noticeable in the patient. Thus we found scattered granule cells in the blood in several painters who were under treatment for some other illness, and who showed no other sign of saturnism, a proof that the lead alters the blood even so early, and an indication to those affected that they should withdraw even further from the possibility of absorbing lead in their work.

Taking into consideration the numerous possibilities of contracting lead-poisoning in daily life, it seems certain that the examination of the blood will be of real use in the future in many doubtful cases of obscure intoxication in investigating the existence of lead-poisoning when it is scarcely suspected.

[1] Deutsches Archiv f. klin. Med., 1900, No. 67, p. 357.

But a negative condition of the blood can also be of great diagnostic significance. Thus, a few weeks ago, a painter entered the Charlottenburg Hospital with complaints of abdominal pains, colicky in character. A distinct blue line on the gums pointed to the main illness, yet the patient declared that for the past six weeks he had no longer used paint containing lead. The blood examination for granule cells gave an absolutely negative result, and upon more detailed examination it became evident that it was not lead colic, but dilatation of the stomach, due to motor insufficiency, which had caused the colicky pains. Thus, in this case, also, the blood examination led to the correct diagnosis. From our present knowledge it seems that, especially in a state of coma, the finding of numerous granule cells will be a valuable support to a diagnosis of saturnine encephalopathy against anæmia and like conditions.

From four to six weeks after treatment has been begun the granules usually disappear from the blood in saturnism. Here, therefore, we have a sure objective point of support for the success of therapeutic measures.

2. In malarial cases granular degeneration occurs frequently. In the first place, A. Plehn,[1] in Kamerun, found basophile granules in the blood-cells of Europeans shortly after their arrival in the tropics. These persons, without any manifest infection with malaria, dysentery, or other infective process, became anæmic to a striking degree and showed a marked decrease in the quantity of hæmoglobin in their blood. Plehn found, for the most part, rather plumper granules than our patients with lead poisoning showed (about 8 to 10 in single red corpuscles). Plehn was of the opinion that they were due to the breaking up of the corpuscles by the malarial parasites, which, to be sure, had as yet caused no outspoken fever or other symptoms, but could still have destroyed the red corpuscles and have made the persons affected anæmic.

Without entering upon a discussion, from which, even provisionally, one cannot decide whether these granules found by Plehn really have any connection with the malarial parasites, I only want to state as certain that in malarial blood, in patients from southern climates as well as from our temperate zone, granular degeneration frequently occurs. From this we must conclude that in malaria, beside the destructive action of the parasites themselves upon the blood-corpuscles, deleterious substances which can injure the plasma of the red cells must circulate in the blood. Plehn himself has also shown the occurrence of granular degenerated cells in the blood of these patients.

3. In close relation with these conditions in the blood of malarial

[1] Deutsche med. Wochenschrift, 1899, Nos. 28-30.

patients stand observations which I have made from experiments relating to the occurrence of these granules following the continued influence of high temperature. From Plehn's observations we know that in Europeans shortly after arrival in the tropics basophile granules appear with striking frequency in the red blood-corpuscles. Now, since it seems certain that at least some of these granules have nothing to do with the malaria parasites, but are only a result of degeneration in the protoplasm of the cells, the question arises whether these changes are not a result of the high atmospheric temperature, which may, perhaps, have an injurious influence upon the organism of the Europeans who come from a temperate zone.

Without being able to decide this important question definitely, I should like to mention the following experiments upon animals, which speak for the possibility of direct injury to the red blood-corpuscles by high atmospheric temperature.

In my laboratory we kept white mice in well ventilated boxes at a temperature over 35° C., and fed them often ample amounts of moist food (such as rolls soaked in milk), so that they got enough fluids. With a temperature of from 37° to 40° C. we succeeded in keeping some of the animals alive for months in their boxes. Later, after they had become accustomed to the heat, they stood temperatures up to 43° C. In some of these animals after almost eight days' sojourn in the boxes there occurred a change in the general appearance: the skin seemed moist, the hair became rough and fell out, especially when touched, and the animals were not so lively as before. The blood at this stage proved to be distinctly diluted, and microscopically large numbers of granular degenerated red blood-cells were found. These had not previously existed in a single animal.

It was, indeed, interesting that later the animals still lived in and apparently grew accustomed to the increased temperature, so that they regained their normal appearance and their earlier liveliness. In accord with this the granules had disappeared from the blood, and some of the animals, as mentioned, remained alive for months in the boxes.

From these experiments we concluded that degenerative changes occur in the red corpuscles of animals under the simple influence of heightened temperature and in the absence of every other harmful element, and these shortly lead to a distinctly anæmic condition of the blood-stream. These laboratory experiments naturally do not permit of our deciding, without further knowledge, concerning the behavior of human blood in hot climates; still it seems important to direct the attention of physicians in the tropics to these blood conditions.

I consider it quite possible that many an insidious anæmia which attacks Europeans in the tropics is not to be referred to infection with parasites in the blood or in the intestines, but is due simply to the in-

fluence of the climate; and I think it exceptionally desirable that physicians in the tropics should turn their attention to these conditions. Perhaps the question which is thought by many to be simply one of the action of parasites is in fact really a true question of climate.

4. Granular degeneration of the red blood-corpuscles is found, in especially great degree, in that severe form of anæmia called "progressive pernicious" or "Biermer's anæmia." The majority of these cases, so far as our observations go, depend upon disturbances in the digestion and assimilation of food-stuffs, whence follow changes of the glandular apparatus of the stomach. Cancer of the digestive tract and auto-intoxication from the intestines undoubtedly play the most important rôle in this. Thus we must accept the view that these absorbed poisons cause the degeneration of the red cells, an admission which agrees well with what we know from other observations upon the origin of these severe anæmias.[1] In these cases we find granular degeneration with other marked changes in the red cells—poikilocytosis, polychromatophilia, etc.; it disappears in these cases, too, when one succeeds by judicious treatment in bringing about the patient's improvement or recovery, and it forms a worthy means of aid in the objective estimation of the amelioration or deterioration of the general condition. In one case under our observation the granule cells, after having been present in the beginning in exceptionally great numbers, disappeared from the blood in two weeks when the severely anæmic condition began to improve; while, at the same time, the specific gravity of the blood increased from 1031 to 1042, and the body-weight from 55 to 61 kilogrammes.

As in pernicious anæmia, the granule cells are found in leukæmia and Hodgkin's disease in later stages, that is, after true anæmic changes occur in the blood; while, on the other hand, they are noticeably absent in chlorosis as long as it is uncomplicated by marked intestinal disturbances, such as obstipation and auto-intoxication.

This lack of degenerative changes in the blood-cells in chlorosis confirms the opinion often expressed by me,[2] that chlorosis does not depend upon a disease of the blood itself or of the bone-marrow, but is to be considered a neurosis, which occurs about the age of puberty, especially in the female sex, and leads to an accumulation of plasma in the blood and of fluid in the tissues of the organs; following this the red blood-cells swell from the increased plasma eruption, and become pale and poor in hæmoglobin.

Only when complications, especially obstipation, with symptoms of intestinal auto-intoxication, arise in the course of chlorosis are the degenerative changes in the erythrocytes found in this disease.

[1] Grawitz. Progressive Pernicious Anæmia. International Clinics, 1900, p. 72.
[2] Grawitz. Festschrift der Medizin und Therapie der Gegenwart, vol. vi., 1900.

5. In carcinoma granular erythrocytes are especially numerous, when the position and nature of the tumors are such that the poisonous products of the cancerous process can easily be absorbed. Thus they are very frequent in cancer of the stomach and intestines, but may, on the other hand, be absent in cancer of the uterus, even in advanced stages.

Here, also, under certain circumstances, the presence of these granules in the blood-corpuscles may support the diagnosis, yet a negative finding, without further knowledge, does not speak against cancer of the uterus, as the red blood-disks are not altered by the deleterious matter from carcinoma in all people in the same way. The granules usually appear in very great numbers in those cases of cancer in which the blood shows other grave changes, as poikilocytosis; and we must admit, in those not infrequent cases where, beside a general cachexia, the anæmic changes are so very well developed that they can sometimes almost counterfeit the picture of Biermer's pernicious anæmia, that the cancer-poisoning has an overpowering influence upon the blood; also, the blood-cells of such people are often strikingly incapable of resistance.

6. Finally, the septic diseases must be mentioned. In these the granules are often found in the blood in great quantities. I have often referred[1] to the fact that in sepsis severe anæmic conditions often develop with especially great rapidity; hence, the presence and agency of an intense blood poison must be admitted in just these diseases. The finding of granular erythrocytes confirms this opinion wholly.

No less important than the positive finding of degenerative changes in the erythrocytes are also negative results, when constantly observed, as they admit the conclusion that in such morbid processes no direct blood poison is produced.

Of those diseases which are oftenest associated with a distinct anæmia next to chlorosis, which has been mentioned above, I would next call attention to tuberculosis of the lungs, in which, even in advanced stages, the degenerative changes in the red cells are absent as long as no suppurating cavities, with hectic fever, have produced that cachectic state which must be due, not to tuberculosis as such, but to pus infection. In tuberculosis, also, the absence of degenerative changes in the blood confirms the views which I had derived from certain earlier experiments. From these investigations I concluded that the extreme pallor of tubercular patients does not depend upon the total destruction of the red blood-cells, but upon the involvement of the blood in the general tissue atrophy, so that a condition of true oligæmia, that is, a reduction of the general amount of blood, develops; following this, the vessels of the skin are insufficiently supplied, and general pallor and anæmia are the results.

[1] Grawitz. Klinische Pathologie des Blutes, 1896.

It is, next, worthy of notice that the granules are not found in syphilis, either in the primary or later stages; and that, in saturation with mercury, also, nothing of the sort is seen in the blood. So, too, the granules are absent in chronic nephritis, chronic liver disease, diabetes, the acute infectious diseases, typhoid fever, and diphtheria.

From the above observations I have come to consider the finding of granular erythrocytes of importance when they occur in certain pathological conditions with some constancy, and also when they are regularly absolutely wanting. Their presence or absence permits us to decide upon the etiology of many anæmic conditions, that is, makes it possible for us, taking into consideration the other results of experimentation, to determine whether, in this or in that disease, a true blood poison exists, or whether the anæmia is to be taken as but one symptom of a general cachexia. The granules are naturally to be considered only as a symptom which occurs under several conditions, and which does not permit, therefore, of but one conclusion. On the contrary, like other symptoms, it is of value only when considered together with the other signs of disease. The occurrence of a few scattered granular erythrocytes is without significance. The diagnosis can be aided, in many doubtful cases of anæmia, by the finding of granule cells, or by their absence. Especially is this the case in certain instances of saturnism which are hard to recognize; also, too, in those cases in which there is a question whether the existing anæmia is to be referred to a malignant neoplasm or to chronic nephritis or similar diseases. The relation of the granules to the etiology of so-called tropical anæmia I have already demonstrated above. In many cases granular degeneration appears in the blood as the first distinct sign of anæmia, even before other morphological changes are recognizable; so that it is, in such cases, especially important as an early symptom of anæmia. In some cases it occurs, indeed, as the only morphological change.

IDIOPATHIC DILATATION OF THE ŒSOPHAGUS.

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By the term "idiopathic dilatation of the œsophagus" those conditions are meant in which there is a dilatation of the œsophagus without any mechanical obstacle within or outside of the œsophageal walls or cardia.

Idiopathic dilatation of the œsophagus has been known to the medical profession since the beginning of the nineteenth century. Thus Purton[1] reports a case of this disease in 1821; he gives a minute and

characteristic description of the affection under consideration, and the following may be cited from his article:

"Patient, forty-three years old, when a youth, received a severe blow on the sternum, which deprived him for some minutes of sense and motion; ever since which time he has labored under more or less difficulty in swallowing. Throughout the last twenty years, during which time I have occasionally attended him, he has suffered at intervals many very severe attacks, continuing sometimes for three weeks or more; during the whole of this time scarcely any food entered the stomach. Occasionally, however, he was able, for months together, to propel, after violent exertions, the contents of the sac into the stomach. If the food was not propelled into the stomach by a certain degree of force he would reject it; so that latterly he never attempted to use any violent efforts, but would suffer it to remain in the sac for hours, and even days; and probably it was in part digested, as the internal surface of the sac presented, in a slight degree, the rugose appearance of the stomach. . . . No kind of food passed through the contracted cardia until the sac above it was quite distended; nor did he until then attempt to use any voluntary exertion, as experience had taught him that previous efforts were ineffectual.

"On dissection the œsophagus was found greatly distended, forming a sac or pouch reaching from within two inches of the pharynx to the cardia; it contained by admeasurement full two quarts. The cardiac orifice was found pervious, but much contracted; no particular appearance of disease was remarked in any other viscus."

A few years later, in 1833, Hannay[2] published another case of dilatation of the œsophagus, causing dysphagia. In his patient the difficulty of swallowing had existed since boyhood, at which time the patient had received a violent blow on the chest, inflicted by a club or shinty. Hannay expressly remarks that "no obstruction was experienced on passing a probang." At the autopsy the œsophagus was found enormously dilated, and the parietes of the tube were several times their ordinary thickness. There was no obstruction either by tumor, external to the tube, or by constriction within the canal.

In these two cases of Purton and Hannay the diagnosis of dilatation of the œsophagus, although surmised during life, had not been made until the autopsy; it is only within the last twenty years that this disease was definitely recognized during life. Zenker,[3] Strümpell,[4] Mermod,[5] Meltzer,[6] and myself[7] were among the first to describe such cases during life, and also to advance the diagnostic features of this disease. Mermod's article, appearing in 1887, contains the first clinically well described, thoroughly examined case of idiopathic dilatation of the œsophagus. He recognized the intimate connection existing between the cough found in these cases and the dilatation of the œsophagus. He says:

"The general state seems to grow better, but the vomiting and the night cough continue; the latter is uselessly fought with by the ordi-

nary measures, and the physician in attendance appears to have had an uneasiness with regard to the chest."

He also observed the important fact that a tube introduced into the stomach of such a patient may find this organ empty, while there is food above the stomach (in the œsophagus), not appearing through it, unless the latter be partly withdrawn in such a manner that the end of the tube lies within the œsophagus. He says:

"While a flexible tube introduced without the least difficulty into the stomach brings up nothing, or merely pure water which has just been ingested, the patient vomits food substances, which appear in large quantity around the tube. I withdraw the latter for 10 or 15 centimetres and now the same food substances appear through it."

The existence of two cavities above one another, the œsophagus being the one and the stomach being the other, in which fluids may accumulate without mixing with each other, Mermod ingeniously showed by the separate ingestion of two differently colored fluids into the cavities. He describes this experiment in the following words:

"I carefully clean the upper pouch until the water returns perfectly clear; then I pour in about 220 grammes of lukewarm water, slightly stained red by means of cochineal. The tube which is withdrawn from the mouth, and a few minutes later again inserted into the œsophagus, brings up a red liquid, which corresponds to the entire quantity ingested. I now put the tube 15 centimetres further down into the stomach, which has not received one drop of the coloring matter, for the water which I now pour in returns unstained."

He concludes his article with the following words:

"Thus we have here a purely functional spasmodic contraction and not a permanent organic stricture, for a bougie of ivory of 13 millimetres' thickness encounters but a very slight resistance, which quickly disappears for the further introduction of the bougie, and which is often met with in every other œsophagus."

To Meltzer is certainly due the credit of having described a case of dysphagia clinically among the first observers, and to have given an explanation for this condition in the spasmodic contraction of the cardia.

Strümpell as well as Meltzer made use for the diagnosis of this condition of the different qualities existing in the vomited matter (in the one case coming from the œsophagus, in the other from the stomach), the former being neutral in reaction, while the latter shows the existence of an acid, mostly hydrochloric acid. In my own case, described in 1888, I could confirm the last two observers and add the so-called "coffee experiment," which consists in having the patient drink a cupful of black coffee one hour before the examination. The patient is instructed to try and force the coffee down by taking deep inspirations and compress-

ing his thorax, thus mechanically forcing the fluid from the œsophagus into the stomach. An hour later the patient drinks a glassful of water. The tube is now inserted into the œsophagus, the water appears quite clear, and is regained in almost the same amount as taken by the patient. Thereupon the tube is pushed in a little further into the stomach, and now some coffee will appear without the admixture of water. This experiment shows that the water has remained above the stomach in the œsophagus, not mixing with the coffee. Apart from the different color in these two fluids it is self-understood that the water obtained from the œsophagus will show a neutral reaction, while the coffee, gained from the stomach, will show the characteristics of gastric juice, presence of hydrochloric acids, and ferments. This coffee experiment is based upon the same principles as Mermod's color solutions, and serves the same purpose. When I described my first case of dilatation of the œsophagus and mentioned the coffee experiment I did not know of Mermod's case, and thus the credit for this diagnostic means belongs to him.

During the last ten years a great number of well-observed cases of dilatation of the œsophagus appeared. Thus Kreuder,[8] Leichtenstern,[9] Hoelder,[10] Maybaum,[11] Fleiner,[12] Jaffé,[13] Rumpel,[14] Wiebrecht,[15] Ewald,[16] Boas,[17] Reitzenstein,[18] Netter,[19] Westphalen,[20] Rose,[21] and Jung[22] have written extensive papers on this subject. Mintz[23] and Reitzenstein were the first to describe the occurrence of diverticles of the œsophagus in its lower portion.

Rumpel has described two typical cases of spindle-shaped dilatation of the œsophagus with autopsy. To Rumpel credit is given for having first examined the œsophagus by means of X-rays after the ingestion of a 5 per cent. subnitrate of bismuth mixture; the enlarged œsophagus could then be recognized by its shade on the breast. He also suggested the following ingenious method of examination in order to differentiate between a low-sitting diverticle and a dilatation of the œsophagus: A thick tube, provided with numerous openings along its lower portion (for about 15 cm.), is introduced into the stomach in such a manner that some of the openings are still in the œsophagus. Another tube of thinner calibre, to which a funnel arrangement is attached, is then introduced into the œsophagus. A certain measured quantity of water is now poured through the funnel into the œsophagus, and the funnel lowered in order to siphon out the fluid; now, if we have to deal with a dilated œsophagus the water poured into the organ will run through the openings of the tube, above the cardia, into the stomach, and thus the œsophagus being empty nothing will return through the lowered funnel of the œsophageal tube. If, however, a diverticle is present the water, poured in through the thinner tube, will remain there, and thus most of it will return on siphonage.

Transillumination of the œsophagus has also been tried for diagnostic purposes, first by Mintz and later on by Rumpel and others. In some pronounced cases of dilatation of the œsophagus transillumination can be obtained.

A few years after the publication of my first case of dilatation of the œsophagus I[24] had an opportunity to observe another instance of the affection, with the only difference that in the new case there was encountered first a stricture of the cardia, which, however, quickly yielded to dilatation by bougies; the dilatation of the œsophagus, however, remained unaltered. A description of this case may be found in the *Post-Graduate.*

At the meeting of the German Medical Society, May 7, 1900, K. Dauber[25] read an exhaustive paper upon this subject, and described four cases of his own of spasmodic contraction of the cardia with dilatation of the œsophagus.

Within the last five years I had the opportunity of meeting with a considerable number of cases of idiopathic dilatation of the œsophagus. In so far as this affection appears to be quite rare—in the entire literature only about forty-five cases being mentioned—I deem it of interest to report a few of my cases in full, and to treat the rest in a more condensed form. In conjunction with this I shall endeavor to describe the symptomatology, diagnosis, and treatment of this affection, based principally upon my own experience.

Case I.—Mrs. K. C., aged about forty-five years, has been complaining for the last two years of difficulty in eating. While at first she would only occasionally notice that she would have to stop in the middle of the meal, on account of a feeling of oppression within her chest, recently there is hardly a meal that she can enjoy without trouble. She noticed that she must eat and drink very slowly, as otherwise the feeling of oppression would come sooner. During the meal she is obliged to make several intermissions, at which she takes a few mouthfuls of water and tries to get the food down. Solid particles of food seem to cause somewhat more difficulty than liquid and semiliquid foods, although the latter alone also cause distress. Occasionally, especially if the patient has taken a meal without caution, she is obliged to vomit, in which event the food returns quite unchanged. During the night she occasionally awakens with a feeling of constriction in her chest and a constant irritation in her throat, necessitating incessant coughing for quite a while. Often these coughing spells are followed by vomiting, in which event there is at once a decided sensation of relief. Patient has lost considerably in weight, about thirty-five pounds.

On examination the chest organs, as well as the abdominal viscera, were found normal. Patient looked somewhat pale and anæmic. She was then told to drink some water; no swallowing sound could be discovered on auscultation at the ensiform process. A tube introduced into the œsophagus, at a length of 33 cm., brought up some water and undigested particles of food, giving a neutral reaction. The tube was

then slowly pushed a little further in, down to a distance of 40 cm. from the teeth. When the contents stopped flowing the tube was pushed still further, without encountering any resistance, into the stomach. Now, again, some contents were expelled through the tube. The analysis of these, the gastric contents, showed a faint acid reaction, absence of hydrochloric acid and of ferments, the particles of food being very little changed, if at all.

On the following morning the patient, in the fasting condition, took a cupful of black coffee, and for a few minutes tried to force the coffee into the stomach by compressing the thorax after deep inspirations. Three-quarters of an hour later, when in my office, she took 250 c.cm. of water, and while drinking I failed to hear any swallowing sound. Five minutes after the ingestion of the water I introduced a tube into the œsophagus (length, 35 cm.); the entire amount of water returned without any admixture of coffee. The tube was then pushed further down into the stomach, and now by the expression method about 60 c.cm. of a coffee-colored fluid were obtained, giving the characteristic coffee odor. Here, also, hydrochloric acid and ferments were missing.

The patient was put on a diet consisting principally of milk, eggs, cereals, butter, and very little meat. She was told to eat four times daily and to practice exercises for forcing the food down after each meal. Each night before retiring she was instructed to introduce a tube into the œsophagus, empty its contents, and wash it out. This treatment was crowned with good result, in so far as the general condition of the patient improved, the coughing stopped, and she gained in weight, but the difficulty in eating or the dysphagia remained.

Case II.—*August* 25, 1899. Francis P. R., aged twenty-eight years, merchant, began to be troubled with "pains in the abdomen" about three years ago. Hot water would make him vomit, and he would feel better. Soon afterward he noticed that he could not eat. Everything he took seemed to burn his gullet, and would not go down. He began to regurgitate the food and to lose in flesh. During a period of constipation the symptoms were worse. Patient is compelled frequently to get up from the table before finishing his meal, having a suffocating feeling, connected with fright. After several coughing spells a small portion of food would be regurgitated, after which he would feel better. Occasionally hasty gulping down of water prevented such an attack. At night, in the recumbent position, the patient is often disturbed by coughing spells. Occasionally food is regurgitated during sleep, and the patient, when awakened, finds the pillow soiled. Patient has lost thirty pounds in weight.

The physical examination of the chest and abdominal organs does not reveal anything abnormal; the swallowing sound is found absent; a thick bougie passes the cardia without resistance. A tube introduced into the œsophagus brings up 100 c.cm. of undigested food, surrounded by mucus.

26*th*. Fasting condition. The œsophagus is found to contain food; a thick bougie passes the cardia without any resistance. The patient drinks a cupful of black coffee and uses exercises serving the purpose of compressing the chest. Thirty-five minutes later he drinks about 250 c.cm. of water; no swallowing sound can be heard. Three minutes later a tube (38 to 40 cm.) is introduced into the œsophagus; the water and a few pieces of roll are voided, but no trace of coffee can be dis-

covered. The reaction of the fluids is slightly acid; there is no free hydrochloric acid present, and no ferments. Then the tube was introduced further down into the stomach; this time, however, a slight resistance was encountered at the cardia, but was easily overcome. By the expression method a fluid of distinct coffee-brown color is obtained, giving the following reactions: HCl absent, strongly acid, rennet and pepsin ferment present.

The treatment consisted in œsophageal lavage before retiring, a mixed diet rich in milk, cereals and butter, and regular exercises for forcing down the food from the œsophagus into the stomach. Patient gained twenty pounds in a period of six months, felt stronger and better in every respect, but his dysphagia remained unaltered.

Case III.—*September* 17, 1898. Margerie S., aged fourteen years, has been troubled for the last two years with attacks of suffocation, appearing in the middle of the meal. She is often obliged to regurgitate the food. During the last year she has frequently vomited. In her sleep she is often disturbed by coughing spells.

An examination of the chest and abdomen does not reveal anything abnormal. The swallowing sound is absent. The thick bougie passes the cardia without any resistance. A tube introduced into the œsophagus brings up about 100 c.cm. of milk and pieces of cracker. The milk is not coagulated and shows neutral reaction. The tube is then pushed further down into the stomach, no resistance being encountered at the cardia. By the expression method real gastric contents are now obtained, consisting of coagulated milk and finely divided particles of cracker. In this portion free hydrochloric acid as well as the ferments are present. The treatment was the same as in Case II.

The remaining cases I prefer to give in abstract:

Case IV.—1896. Miss T., aged forty years, troubled with dysphagia for the last five years. No swallowing sound present. Thick bougie meets with no resistance at the cardia. Œsophagus is found to contain contents of slightly acid reaction, but no free hydrochloric acid or ferments present, while the real gastric contents reveal the presence of free hydrochloric acid.

Case V.—1897. Mrs. L. S., aged thirty-three years, troubled with dysphagia for the last four years. Swallowing sound absent. Thick bougie passes cardia without resistance. Crackers, taken the night previous, are found in the œsophagus, the reaction being neutral—ferments absent. At the same time gastric contents are obtained, showing the presence of free hydrochloric acid and ferments.

Case VI.—*August*, 1897. Max G., aged twenty-eight years, troubled for two years with dysphagia and attacks of asphyxia. Swallowing sound absent. The tube meets with slight resistance at the cardia, which is, however, easily overcome. Contents are found in the œsophagus (with neutral reaction, absence of ferments) and also in the stomach, the latter showing the presence of free hydrochloric acid and ferments.

Case VII.—*June*, 1898. Charles P., aged forty-seven years; feeling of fulness and frequent regurgitations for the last three years; swallowing sound absent; thick bougie encounters no resistance at the cardia. A tube brings up first the œsophageal contents, containing no ferments and showing neutral reaction; and later the real gastric contents, containing free hydrochloric acid and ferments. Transillumination of the

stomach shows the latter organ to be normal. When the lamp is withdrawn and brought into the œsophagus no transillumination area can be seen. Coffee experiment is distinct.

CASE VIII.—*May*, 1899. Mrs. Ida J., aged about thirty years, has been troubled for the last eighteen months with occasional difficulty in swallowing. Sometimes she apparently is able to eat everything, at other times, however, she can hardly take liquids with impunity. During the meal she occasionally has a suffocating spell. She does not complain about coughing; swallowing sound absent. Thick bougie passes cardia without any resistance. Two hours after a meal consisting of crackers, milk, and eggs the examination with the tube revealed the presence of about 100 c.cm. of unchanged food in the œsophagus, this portion giving a neutral reaction and showing no ferments. The tube introduced further into the stomach now brings up another portion of chyme, showing the presence of acid and ferments, but no free hydrochloric acid.

CASE IX.—*October*, 1899. Ludwig S., aged forty years, suffers from dysphagia; considerable coughing during the night; swallowing sound absent; bougie meets with some resistance at the cardia, 39 cm. from the teeth, which is, however, overcome. A thicker number meets with more resistance, but also passes. Two hours after a test-meal the tube introduced into the œsophagus brings up undigested food of a neutral reaction; when the tube is pushed further into the stomach the contents obtained are of a decidedly acid reaction, showing the presence of free hydrochloric acid and ferments.

CASE X.—*June*, 1899. August B., aged thirty-four years, has been troubled with dysphagia for the last four years; swallowing sound absent; a middle-sized bougie meets with some resistance at a distance of fifteen and one-half inches (39 cm.) from the teeth, which is, however, overcome. Yet this result is changeable, for occasionally there is no resistance encountered at all. The examination with a tube two hours after a meal shows the presence of about 120 c.cm. of contents within the œsophagus, consisting of unaltered food of neutral reaction and also of gastric contents of a strongly acid reaction, with the presence of free hydrochloric acid and ferments.

EPICRISIS. In the twelve cases of idiopathic dilatation of the œsophagus observed by me (ten described in this paper and two published previously), there was a distinct etiological moment for the origin of the trouble in two, viz., trauma in one (case published in the *Medical Record*) and a benign stricture in the other (case published in the *Post-Graduate*). In the latter the stricture quickly yielded to dilatation with bougies, but the dilatation of the œsophagus remained. In all the ten cases described in this paper no etiological factor could be discovered to which the trouble could be ascribed.

As already stated in my first paper on this subject, idiopathic dilatation of the œsophagus may be the result of the following three conditions: 1. Paralysis (or atony) of the œsophagus. 2. Spasmodic contraction of the cardia. 3. A lack in the reflex relaxation or opening of the cardia during the act of swallowing.

The latter condition seemed to prevail in my first case. In a few of the cases described in this paper a resistance was encountered at the cardia when a bougie was introduced, but was easily overcome. In these cases the assumption of a spasmodic contraction of the cardia as a prime factor of the disease is plausible. In the remaining cases it is quite difficult to decide to which of the three possibilities enumerated above the condition was due. Rosenheim[26] ascribes many cases of idiopathic dilatation of the œsophagus to atony, while Meltzer, Ewald, and Boas plead for a spasmodic contraction of the cardia as the prime trouble. In many of the cases mentioned, in which no resistance whatever was encountered at the cardia at any time, a spasmodic contraction existing at the time of the observation must apparently be excluded. Such a condition, however, may have prevailed originally, having caused the dilatation of the œsophagus, the latter remaining even after the cessation of the spasmodic contraction.

Symptomatology. Dysphagia, or difficulty in eating—*i. e.*, difficulty in propelling the food down from the mouth to the stomach—is encountered in all cases of dilatation of the œsophagus. In some cases this difficulty in eating is so little pronounced that the patients themselves are hardly aware of the presence of some abnormal condition. They become conscious of some existing trouble if they accidentally swallow a big piece or take a large drink hastily. A feeling of pressure or fulness within the chest is often encountered. The latter occasionally increases to regular attacks of dyspnœa. A sensation of suffocation is also often met with, especially during meals. The patients are frequently troubled with an obstinate cough, which appears principally at night-time in the recumbent position, often disturbing the patient's sleep. Vomiting or regurgitation of the œsophageal contents appears occasionally pretty soon after meals, or at night-time in the recumbent position, accompanying the coughing spells. The difficulty in eating and the fear of the suffocating spells cause the patient to take less nourishment than required, and consequently there is usually a considerable loss of flesh observed. The appetite, as such, is generally not impaired. The bowels are mostly regular, but rarely constipated.

Objective Symptoms. The swallowing sound of Meltzer is absent. I consider this as a very important point. In none of my cases could either the first or the second swallowing sound be heard at the ensiform process. A few of the writers state that in some of their cases of dilatation of the œsophagus the first swallowing sound was present. Thus Westphalen mentions that in his case the first swallowing sound was present and different in character from the normal sound, for it was produced as if liquid splashed into a cavity containing another fluid. Westphalen considers this quality of the sound as characteristic of a

dilated œsophagus. I have, however, encountered a very similar "first swallowing sound" in a patient who had no dilatation of the œsophagus.

Examination with the tube shows that when the latter is introduced at a length of about 30 to 35 cm. into the œsophagus contents appear through the tube as well as sometimes also outside of it, being undigested, of a neutral or slightly acid reaction, and containing no pepsin or rennet ferments. When the same tube is pushed further down into the stomach real gastric contents can be obtained, showing the presence of hydrochloric acid and ferments. Examination with a silkworm bougie is often of importance, especially in cases in which a resistance of the cardia is encountered; the latter bougie, being less flexible, will not turn over itself, and will enable us to judge more accurately of the distance from the teeth to the cardia and also whether the latter orifice has been penetrated.

The coffee experiment, described above, will serve to show positively the existence of two cavities in which fluids collect without mixing with each other.

Diagnosis. Idiopathic dilatation of the œsophagus will be diagnosticated when dysphagia of long standing exists, the swallowing sound is found absent, no organic stricture encountered, and the œsophagus found partly filled with unaltered food.

The differential diagnosis must exclude malignant growths, a low sitting diverticle of the œsophagus, and an antrum cardiæ.

A malignant growth which has not led to a stricture is never accompanied by dilatation of the œsophagus; moreover, the swallowing sound will be found present. The general signs of malignant disease will also be discovered.

A low-sitting diverticle occurs but very rarely. Its existence may be excluded if the bougie or tube always enters the stomach without much difficulty. Rumpel has suggested the examination with two tubes as mentioned above, in order to differentiate between diverticle and dilated œsophagus. It appears to me that Rumpel's method should be applied only in those cases in which the tube often fails to enter the stomach; otherwise we can be pretty sure that we have to deal with dilatation of the œsophagus and not with a diverticle.

An antrum cardiæ, which occasionally occurs, is but a very small sacculation, containing only at the utmost 50 c.cm. The latter will therefore be excluded if we find that the cavity above the stomach is able to hold 200 or more c.cm. Transillumination, œsophagoscopy, and X-ray examinations of the œsophagus have also been used for diagnostic purposes in this affection.

Prognosis. The prognosis is good *quo ad vitam*, but bad as regards complete recovery. All of my cases improved considerably very

quickly; the patients were all able to attend to their daily vocations and to enjoy almost perfect health, with the single exception that the dysphagia continued.

TREATMENT. *The diet* should consist of liquid, semiliquid, and solid foods rich in nutritious material. After each meal the patient must be instructed to perform exercises, consisting in compression of his chest after deep inspirations for a few minutes; this serves to force the food down from the œsophagus into the stomach.

Lavage of the Œsophagus. Every evening before retiring the œsophagus should be emptied and washed out by means of a tube.

The application of the faradic and also of the galvanic current within the œsophagus has been recommended by Rosenheim and others. I had the opportunity to make use of the faradic as well as of the galvanic current in one of my patients, but without the slightest benefit whatever. Feeding through a stomach-tube has been tried without permanent relief.

A sufficient diet, the exercises for forcing the food down, and lavage of the œsophagus are the essential points. Bromides, iron, and arsenic may also be of occasional benefit.

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MYOSITIS OSSIFICANS.

WITH A REPORT OF TWO CASES.[1]

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The comparative rarity of myositis ossificans, its peculiar clinical and anatomical manifestations, and, more than all, the mystery enshrouding its etiology, make the disease one of great interest to the pathologist, the clinician, and the surgeon; and the report of two similar cases, while it may add little to the existent knowledge on the subject and do little to enlighten us as to the etiology of the disease, cannot fail to be of value. As Roth says: "If we no longer, in the present state of our knowledge, consider myositis ossificans as a pathological curiosity, yet, in view of the still small number of published cases and the darkness which still hovers over the whole character of the affection, the demonstration of a patient suffering from this mysterious disease must be interesting."

The autopsies in my cases were made by Dr. Warthin, and it is to his kindness that I am indebted for the post-mortem notes, the material, and many valuable suggestions.

The first of the cases is of a young farmer, aged twenty-three years, the cause of whose death was pulmonary and laryngeal tuberculosis. He died April 11, 1897. His clinical history presents nothing of interest in this connection until March 1, 1897, when he complained of pain in the left leg. On examination the left leg and foot were found swollen, soft, and œdematous. The thigh was also swollen, though less than the leg. On March 28, 1897, examination showed the left leg only slightly œdematous, and it was no longer painful. A marasmic

[1] Read before the Washtenaw County Medical Society, March 5, 1900.

thrombus of the left saphenous vein was believed to have caused the œdema.

The autopsy showed a very general tuberculous process. Both lungs were infiltrated with tubercles and contained large cavities. Small tubercles were found in the spleen, liver, adrenals, and kidneys, and a tuberculous ulcer in the lower part of the ileum. The bronchial glands contained many areas of caseation, the mesenteric glands were enlarged and some of them caseated, and all the lymph glands of the body were enlarged.

In the left saphenous vein was found an old, partially organized thrombus, extending downward for a distance of about ten inches. This extended upward into the femoral vein, which was partially closed by a mixed thrombus, apparently fresh. From the femoral vein the partially obturating thrombus extended into the left external iliac, and through this in constantly decreasing size into the left common iliac and the abdominal vena cava. Around the wall of the femoral vein there was an area of hyperæmia and infiltration, extending apparently from an enlarged lymph gland near by. This gland on section showed infiltration and beginning caseation.

The femoral vessels with the thrombus and the circumjacent fat, connective tissue, and muscle were removed, hardened in Müller's fluid, dehydrated, embedded in celloidin, and sectioned. The sections were then stained in hæmatoxylin and eosin. Some of the sections were counterstained in Van Gieson's picric acid and acid-fuchsin mixture, and others were stained by Unna's orceïn method for yellow elastic tissue.

The microscopical appearance is as follows: Both femoral vessels are nearly or quite filled by thrombi in various stages of organization.

The whole section shows marked hyperæmia, all the smaller vessels and even the capillaries being distended and packed full of blood corpuscles. The connective tissue surrounding the large vessels, as well as that around the smaller ones, is infiltrated with leucocytes. Especially around the distended capillaries are seen aggregations of small round cells. This leucocytic infiltration is especially marked in the intermuscular connective tissue and around the capillaries found in that connective tissue. Many of the leucocytes are markedly degenerated, and in some parts of the sections larger or smaller necrotic, abscess-like areas are found. Surrounding these necrotic areas, and indeed in many parts of all the sections, attempts at repair are noticeable. The inflammatory tissue seems to have been replaced by a new granulation tissue, rich in small, thin-walled bloodvessels and in large plate-like cells, with little fibrous tissue.

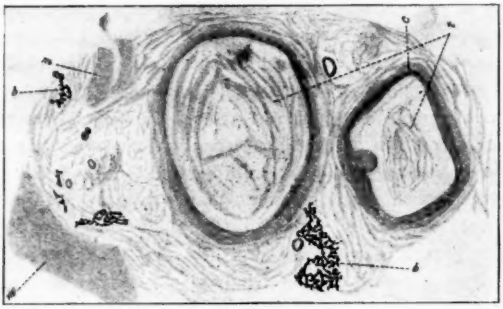
The most marked changes to be noted are, however, in the muscular tissue. As before stated, the intermuscular connective tissue is hyper-

æmic and infiltrated with leucocytes. In some parts of the sections, especially at the periphery, the muscle appears fairly normal, but even here, in most of the fibres, the cross striation has disappeared or is less distinct than in normal muscle. The longitudinally cut muscle fibres, which are of normal size near the periphery, become smaller as they near the centre, and may taper to a point or divide into several muscle fibres or seem to resolve themselves into numerous bundles of fibrous tissue. Nearer the centre of the section the muscle fibres are all much smaller than normal, of very irregular contour, with no cross striations, and in some even the longitudinal striation seems lost, the fibres appearing either finely granular or quite homogeneous. In some places a muscle nucleus with a small spindle-shaped bit of protoplasm is separated off from the rest of the cell. The nuclei may be absent from a considerable part of the fibre and crowded together at one end or at one side, and often a small, narrow fragment of muscle containing many nuclei is seen. Some of the longitudinally cut muscle fibres, after decreasing in size, suddenly enlarge, club-like, at the extremity, this enlargement containing large numbers of muscle nuclei. Often small, isolated fragments of muscle are seen in the granulation tissue, and even in and near the inflammatory, necrotic areas, containing numerous nuclei, embedded in homogeneous appearing protoplasm, producing the appearance of giant-cells. We find everywhere marked variations in the size and shape of the muscle fibres, with the ends pointed, branched, or club-like. Along the course of the fibre the nuclei are generally greatly increased in number and are scattered irregularly through the apparently undifferentiated sarcoplasm. Beside the simple atrophy, some of the fibres seem to be undergoing fatty degeneration and some Zenker's waxy necrosis.

In the granulation tissue, which seems to have replaced the larger inflammatory areas, we find irregularly branching and anastomosing trabeculæ of osteoid tissue, consisting of a dense matrix, enclosing rather large cells, which are usually not surrounded by a capsule. These trabeculæ surround smaller areas of granulation tissue which is richly supplied with bloodvessels and which here somewhat resembles bone-marrow. Many of the large cells of these spaces are arranged in a more or less continuous layer on the trabeculæ, like the layer of osteoblasts on the trabeculæ of developing bone. Most of the osteoid tissue has undergone calcification, at least in the central part, so that, according to Ziegler's definition, we may believe that we have here a true ossification process. In some of the sections these plates of bone form a nearly continuous ring around the larger bloodvessels. In others they are scattered throughout the section in smaller masses, always found in the new granulation tissue, never in the old connective tissue, nor in the inflammatory tissue which is still undergoing retrograde changes.

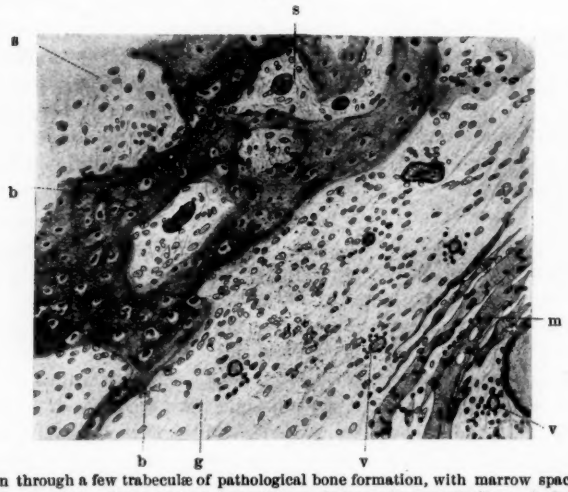
These ossified masses are found not only immediately around the femoral vessels, but extending out in all directions between the degen-

FIG. 1.



Section through both thrombosed femoral vessels, muscles, fat, connective tissue and granulation tissue containing plates of bone. m, muscle; b, bone; c, calcification; t, thrombus. Drawn under the dissecting microscope, with aid of camera lucida. Magnified about eight times. Reduced to one-half size of drawing.

FIG. 2.



Section through a few trabeculæ of pathological bone formation, with marrow spaces, surrounding granulation tissue, and, at the periphery, degenerating muscle fibres. b, bone; m, degenerating muscle; g, granulation tissue; s, marrow spaces; v, capillaries surrounded by connective tissue infiltrated with leucocytes. Drawn with the aid of the camera lucida. No. 2 eye-piece; ⅙ in. objective. Reduced to one-fourth.

erating and regenerating muscle fibres, wherever a sufficiently large area of granulation tissue is found. The relation of the plates of bone

to the other tissues of the section is represented in Fig. 1. In the marrow spaces we see frequently small bits of degenerated muscle, atrophied, non-nucleated, and appearing homogeneous.

It may not be uninteresting to speak here briefly of the changes in the yellow elastic tissue as brought out by Unna's orceïn differential stain. In the necrotic areas, in the degenerating inflammatory masses, the yellow elastic tissue seems to have disappeared or to have lost its power of taking the differential stain. In some parts of the granulation tissue, on the other hand, we begin to see short pieces of fine fibres, which are well stained with the orceïn, the surrounding tissue remaining unstained, while in the older parts, at the periphery of the larger bone-containing masses the fibres are coarser and more massed together. Even in the bone tissue itself, fine, yellow elastic fibres are occasionally seen. It seems unquestionable that in this process the yellow elastic tissue, as well as the muscle and fibrous connective tissue, degenerates and regenerates.

The enlarged lymph glands in the neighborhood of this hyperæmic process were removed and examined. No tubercle bacilli were found, nor was the histological structure that of a tubercle, but rather of a simple, necrotic abscess.

The changes in the tissue would seem to indicate that the intermuscular inflammation, the changes in the muscle, and the bone formation antedated by a considerable time the thrombosis, which was probably secondary to the other changes, and was the cause of the clinical symptoms noted about a month before death.

In the second case I have found nothing of interest in the clinical history except the fact that the thigh was broken about five weeks before the man's death.

In this case also there was an obturating thrombus of the femoral vein, and the microscopical appearance is identical with that in Case I. The only difference in the two cases is that in Case I. the process seemed to result from a chronic inflammation (possibly tuberculous), while in Case II. it resulted from an injury to bone, which may have injured also the muscle and other soft parts. It should be stated, however, that the fracture was not near the point of ossification of the muscle.

In both cases we have thrombosis of the femoral vein, which has not occurred in any of the other cases cited in the literature to which I have had access; also periarteritis, periphlebitis, inflammatory infiltration of the intermuscular connective tissue, with degenerative changes in the muscle, and ossification of the granulation tissue.

In both cases, also, the process was not discovered until the autopsy had been made and the sections examined microscopically.

Cases of pathological ossification naturally divide themselves into two great classes: those in which bone is formed in connection with bone,

and apparently resulting from an abnormal activity of the cells of the periosteum, and those in which bone is formed in the softer tissues and has no connection, primarily at least, with the skeletal bones or their periosteum. Of the first class I need say nothing further, as the consideration of these cases is quite foreign to my subject. In the second group of cases, myositis ossificans may be said to occupy a very prominent position. Cahen divides this disease into two classes: a progressive form and a localized or stationary form. The progressive type, known as myositis ossificans progressiva, is, according to Cahen, distinguished from the localized form by the facts that it begins in youth, advances periodically, and attacks many series of muscle groups. To this type belong most of the cases recorded in the literature, which is perhaps due to the easier recognition of this type of the disease.

Roth has recently given an excellent review of much of the literature on this subject, and I may be permitted to draw somewhat freely from his review, especially with regard to those works to which I have not had access. The earliest case reported was in 1740, by Freke, in the *Philosophical Transactions*, the description of the case corresponding very exactly with the descriptions now given. In the same journal, in 1741, Copping thus describes a case: "Das ganze Rückgrat war ein zusammenhängender Knochen, von dem sich ein scharfer Rand erhob, der wie eine Handhabe aussah, woran man das Skelet halten konnte. Es waren ihm jedes Jahr aus den Fersen Hörner gewachsen, wie die Sporen bei den Hähnen und die Ueberwüchse von Knochen waren in so grosser Menge da, dass es eben so schwer sein würde, sie zu zählen als die Stalactiten in der Grotto der Calypso." Other cases were noted by Henry (1759), Rogers (1832), Testelin and Danpressi (1844), Hawkins, Wilkinson, and Abernethy.

In 1869 Münchmeyer, giving to the disease the name suggested by v. Dusch, myositis ossificans progressiva, described it so exactly that later writers have been able to add little to his description. He declared the disease to be a constitutional affection of slow course, with periodical exacerbations. The first disturbance in muscular tissue begins with a marked infiltration of the intermuscular connective tissue. The second state—that of connective tissue induration—consists of an excessive growth of intermuscular connective tissue with destruction of fibrillar muscle substance in consequence of pressure atrophy or fatty degeneration. The third state is that of ossification, which begins in the centre of the affected muscle, in the connective tissue ground substance. The disease begins in youth, with local swelling and later loss of function and ossification. Sometimes local and radiating pain is associated with it, and also slight febrile reaction. The skin may be of a higher temperature than normal, and the connective tissue œdematous. The swelling may disappear after two to four weeks, leaving the

muscle hard and ossified, a condition which is sometimes temporary, but generally spreads to the origin and insertion of the muscle, and remains permanent. The disease generally begins in the neck and back muscles, spreading and producing ever-increasing deformity. Münchmeyer reports twelve cases, of which nine were in males, which predisposition of males has been noted by other writers, Roth saying that of the thirty-nine cases which he collected from the literature thirty were males.

Some years later Helferich noted the occurrence of a curious malformation in connection with this disease—microdactylie, an anchylosis of the phalanges of the thumb and a lack of one phalanx of the great toe on both sides. Since his time the same curious anomaly has been noted in 75 per cent. of all the cases recorded. In 1869 Münchmeyer collected from the literature twelve cases of this disease. In 1884 Pinter carefully reviewed the literature and reports twenty-two cases with those of Münchmeyer. In 1896 Pincus very exhaustively reviewed the literature of myositis ossificans progressiva, carefully tabulating the thirty-eight cases which he found. Roth, in 1898, in his review of the literature, mentions having found forty cases, including his own, which number, however, includes the four cases of localized myositis reported by Cahen and one by Schwarz. Eleven of his cases were included in the table given by Pincus, leaving twenty-four which, with the thirty-eight of Pincus give sixty-two cases, which were reported by Skinner, Minkiewicz, Zollinger, Billroth, Byers, Florschütz and Gerber, Ditmeyer, Huth, Nicoladoni, Helferich, Partsch, Kümmel, Uhde and Pinter, Krause, Kohts, Sympson, Willett, Godlee, v. Volkmann, Lendon, Bókai, Macdonald, Svensson, Pollard, Brennsohn, Rabek, Virchow, Carter, Paget, Pincus, Mays, Berger, Storham, Maunz and Lexer in addition to those already mentioned. In an addendum Pincus cites cases from Gibney, Kissel, Linsmayer, Lexer, and Rosenstein.

In a careful review of the literature since 1890 I have found, in addition to those cited by Pincus and Roth, cases of myositis ossificans progressiva reported by Boks, Jones, Nissim, Stonham, Bernachi, Martinez, De la Camp, Lockwood, Bollinger, Jacoby and Morian-Essen, making eleven cases, which, with the sixty-seven collected by Pincus and Roth, make seventy-eight cases. Most of the cases to the reports of which I have had access follow so closely the description of Munchmeyer, already given, that a further reference seems unnecessary; but in one case, reported by Kissel, while the clinical picture was typical of the disease, the microscopical examination of one of the hard swellings revealed the presence of no true osseous tissue, but only of young connective tissue with some remnants of altered muscle. In this case also some of the tumors disappeared, leaving no trace, while others broke down, and a puriform liquid was discharged. This case improved somewhat under treatment, and was regarded by Kissel as an incipient stage

of the disease. The usual history of the disease is a slow progress with longer or shorter pauses, the general health remaining good, death finally ensuing either from some intercurrent affection or from starvation after the disease has involved the muscles of mastication and deglutition.

Cases of ossification confined to single muscles or groups of muscles have been reported by Podrazki, Schwarz, Cahen, Schmit, Lehman, Sieur, Lunden, Albertin, Hutchinson, Lalesque, Eineri, Ramonet, Gazni, Cordillot, Orion, Tricot, Mouchet and Munro, making twenty-three cases with the two reported by myself. In addition to these, Cahen has collected from the literature previous to 1890 twelve similar cases, which were reported by Volkmann, Virchow, Rokitansky, Schuh, Billroth, Otto, Pitha, Rasmussen, and Meinhold. Some of these cases followed a single severe injury, as in the four cases described by Cahen, in which the growth resulted from the kick of a horse. Other cases resulted from repeated injuries or from continued use or strain, under which heading we may include the ossification of the deltoid and arm muscles in soldiers and of the thigh muscles in riders. This perhaps includes far the largest number of this class of cases. Then we have ossification occurring in the course of a chronic inflammatory process, which may be rheumatic, syphilitic, or tuberculous.

Mays, Cahen, Lexer, Kissel and Kümmel have made microscopical examinations of cases cited by them, and the findings of Cahen and Lexer may be compared with my own; Cahen's, because his cases represent a type similar to mine; Lexer's, because he has examined some of the growths from a case of true progressive myositis ossificans.

In the case described by Cahen the tumor was removed, and after a short time returned and was again removed, this time with the periosteum, to which it had become adherent. The sections from these two growths present somewhat different appearances. At the periphery of the section of the first tumor, and crowded together by connective tissue containing many bloodvessels and large spindle-cells, he finds muscle which has undergone many degenerative changes—hyaline degeneration, increase of nuclei of sarcolemma, loss of striation, etc. In the centre of the tumor he finds irregularly arranged trabeculæ of bone, with an epithelium-like lining of osteoblasts, with many lacunæ and giant-cells, and the spaces filled with a marrow extraordinarily rich in bloodvessels and connective-tissue cells. All through the preparation are scattered bits of muscle, the relation being so intimate that single muscle fibres are completely embedded in bone. In the sections from the second tumor no muscle fibres are seen. There are three distinct zones: a zone of greatly increased connective tissue cells, then a zone of small-celled hyaline cartilage, which, by ingrowth of bloodvessels and giant-cells, is changed into bone. There is no distinct boundary between the

cartilage and bone, the cells becoming smaller and losing their capsules, while the intercellular substance becomes denser, more opaque, and stains bluish-red in the hæmatoxylin-eosin double-stain. The development of bone in all cases investigated stood in direct relation with an increase of the intermuscular connective tissue.

Lexer has described quite minutely the microscopical appearance of sections taken from several tumors removed from two cases of myositis ossificans progressiva. Near the periphery of the preparations he finds quite normal muscle fibres. Nearer the centre the muscle fibres are more or less degenerated, the cross striation lost, the muscle nuclei increased, in many cases resembling giant-cells, and the fibre broken up, while the intermuscular connective tissue is increased and infiltrated with leucocytes, especially in the region of the capillaries. The connective tissue contains many cells of different forms arising from division of connective-tissue cells, which may be considered as fibroblasts, while in some places are seen cartilage cells with formation of hyaline cartilage. Nearer the centre the ground substance becomes denser, the former connective-tissue cells lie in small angular spaces and the formative cells lie in rather regular rows on the dense tissue which comprises the osteoid trabeculæ. Later these become calcified, and thus bone is formed. The noteworthy point about this description is its similarity to that given by Cahen and the similarity of both to my own description. This, it seems to me, would indicate that, though the clinical picture differs much, because of the wide-spread distribution of the lesions in the progressive type, yet the pathological changes are nearly the same in the two types of the disease. This may, however, need further evidence.

Much difference of opinion has arisen as to the true character of the bone formation. Virchow places the disease on the border line between inflammation and new growth, and is supported by Lexer, Bollinger and many others.

Mays asserts that it is a true tumor, and is supported by Kümmel, Pinter, Helferich, Pincus, Partsch, Schwarz, Cahen and others. Cahen bases his assertion on the microscopical appearance, especially the fact that new connective tissue, cartilage, osteoid tissue, and bone are found in the same section, thus showing the characteristics of an atypical growth. They consider the inflammatory phenomena and muscle degeneration to be secondary to the tumor formation. Pincus, after a most exhaustive and careful study of the literature of myositis ossificans progressiva and of his own cases, arrives at the following conclusions: The so-called myositis ossificans progressiva multiplex is not a disease, but undoubtedly a tumor belonging to the multiple osteomata and exostoses of Virchow. The process begins in the periosteum, the muscle degenerating secondarily. At the foundation lies an inborn — not

hereditary—constitutional anomaly, the Cohnheim theory of embryonic nuclear *anlagen* not sufficing for explanation ; the constitutional anomaly is to be defined as vulnerability (excessive productivity) of the periosteum and connective tissue of the locomotor apparatus. The disease needs for its development an external cause. As etiological factors we have, above all, trauma ; in a less degree rheumatism. Syphilis, rhachitis, myopathy, and trophoneurosis are excluded. The apparently spontaneous cases arising in early life are really of traumatic origin and due to intrapartum injuries.

Nicoladoni advances the hypothesis that the process is a tropho-neurosis comparable to progressive muscular atrophy and pseudohypertrophy of muscle, but finds no active supporters, although Klemm advances some arguments which seem to support his view, while Schwarz, Eichhorst, and Klemm consider it secondary to a disease of the spinal cord.

Since electrical tests, wherever applied, have seemed to indicate an entire absence of any neuropathic factor, except in the cases of Kümmel and Pincus, where the faradic excitability was much reduced in the degenerated mucles, it seems feasible to consider the disease purely myopathic, either primarily inflammatory in character or having the primary characteristics of a new growth. It seems probable that in the progressive form of the disease many of the swellings are true neoplasms, while others, as would seem to be indicated by Lexer's description, result from an inflammatory process.

Nicoladoni says that in consequence of a diffuse interstitial myositis an indifferent tissue arises which can develop in two different ways : scar tissue and bone. Lexer corroborates this from his microscopical findings, as the tissue arising from proliferation of the connective-tissue cells can, by formation of new fibrillæ, develop into a firm, scar-like tissue as well as undergo a further change into cartilage and bone. Düms believes it the result of irritation of connective tissue through trauma or blood extravasation, and formation of indifferent granulation tissue from which the subsequent developmental changes arise.

In the myositis ossificans limited to single muscles, my observations would, it seems to me, indicate that the primary condition is an inflammatory process in the intermuscular connective tissue, resulting in degeneration of the muscle fibres, either from simple pressure atrophy or from fatty degeneration, so that the name myositis interstitialis ossificans, as suggested by Stonham, seems not inappropriate. The second condition seems to be the establishment of the processes of repair, the formation of a tissue rich in fibroblasts and small bloodvessels, in which white fibrous and yellow elastic tissue fibres are sparingly developed. Before this process proceeds to the formation of mature connective tissue, however, it is interrupted by the change of a part of the tissue to trabeculæ of firm osteoid substance which becomes calcified, while the parts en-

closed by the trabeculæ change to bone-marrow. This change is not so anomalous that it need excite great surprise, since, as is well known, the different members of the connective-tissue groups change with especial readiness to some other form of connective tissue. Bone when broken heals by formation of fibrous tissue, which normally changes to bone, but may remain fibrous in adult life, the cartilages of the larynx and trachea ossify, and other similar changes may occur under certain circumstances.

Many factors have been assigned as exciting causes of this affection: such as cold, unsanitary surroundings, trauma, either slight or severe, either a single injury or many successive injuries, irritation, as in the exercise of bone, or chronic disease processes.

This might be satisfactory on the subject of etiology, were it not that the exciting cause, which most authors admit as a necessary factor in producing the disease, is often so slight and trivial that we cannot believe it sufficient to produce the disease in a normal individual. This is especially true in cases of the progressive type, while in the stationary form of the disease the irritant cause which has operated on hundreds of cases has produced ossification in very few. The explanation of these facts has opened a large field for conjecture and speculation. Virchow believes that there is in these individuals an ossifying predisposition, either hereditary or congenital, which he calls "diathesis ossificata sive ossea."

Mays, Kümmel, Pinter, Helferich, Schwarz, Pincus, Stonham, Paget and many others ascribe it to a congenital, not hereditary, predisposition, which they do not define more exactly.

Maunz suggests as a predisposing causative factor a disturbance of embryonic development. He says: "In the *anlagen* of musculature, where in later life pathological bone formations occur, osteoblastic nuclei enter. These nuclei remain dormant so long as they are held in check by the physiological resistance of neighboring tissues. If, however, this be weakened, the bone *anlagen* develop into the pathological bone formation." He explains in a similar way the occurrence of exostoses and osteophytes which are so frequently found in conjunction with the muscular ossification. Those who favor the view of embryonic disturbance cite the frequent occurrence of microdactylie in this disease as an evidence favoring their hypothesis.

Brennsohn and others suggest the idea that the disease is due to atavistic influence, without, however, expressing any positive belief in the hypothesis. The microdactylie is cited as favoring this theory also. Dr. Warthin is inclined to favor this suggestion in the case of the localized form of the disease. He believes that a sharp distinction should be drawn between the two types, the growths being true neoplasms in the progressive form of the disease, while in the localized form, in which

he includes the inflammatory ossification and the exercise and riders' bones, whose site is quite distinctly limited to the thigh and shoulder muscles, we have an atavistic reversion to the splint bone of lower animals.

Direct heredity seems, from the history of the cases reported, to play no rôle in the causation of the disease, if we except the fact noted by Paget that in many cases rheumatism and cancer occur in the family history.

Atavistic influence seems to me to be contraindicated by the fact that in the hand and foot, where splint bones are most common in the lower animals, these bony growths rarely occur. In the progressive muscular ossification, beginning in early life, it may, it seems to me, be necessary to admit the hypothesis of a congenital condition consisting of an abnormal activity of osteoblastic elements, or, if we accept the Weisman theory of embryonic development, the persistence of indifferent, undifferentiated mesenchymal cells, which, under the requisite conditions of nutrition, develop abnormally into nodules of fibrous connective tissue, cartilage, and bone, sometimes in connection with the skeletal bones, sometimes in fascia, tendons, ligaments, or intermuscular connective tissue. In the localized form of the disease, however, no such hypothesis seems to me to be necessary. We have here a formation of granulation tissue, a new connective tissue, whose cells may therefore revert to the undifferentiated, indifferent embryonic cell type, mesenchymal cells, which may develop into fibrous tissue, cartilage, or bone, according to the prevalent nutritive conditions. Although Gegenbaur suggests the possibility that specialized osteoblastic nuclei are necessary for bone development, the ordinary connective-tissue cells being incapable of such development, there seems, in these cases, no valid reason for the belief that the cells, which in certain regions act as osteoblasts, are histogenetically different from those which, in other localities, develop into fibrous connective tissue.

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SARCOMA OF THE SMALL INTESTINE.

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During the past two years there have been observed at the Mount Sinai Hospital five cases of intestinal sarcoma, four of which came to autopsy. In three of these cases the clinical picture closely resembled that of appendicitis. In attempting to ascertain whether such a resemblance had before been noted, I found that not only was the clinical picture unknown, but also that there had been no complete review of the subject of sarcoma of the intestine since Baltzer wrote his article in 1893.

In the following paper I shall give the details of the four cases of ours which came to autopsy, and refer occasionally to the fifth case. I shall then attempt to give a complete picture of the disease from all its stand-points. I am indebted to Dr. Gerster for his kindness in permitting me to observe four of these cases clinically, to Dr. Lilienthal, in whose service the fourth case occurred, and to Dr. Brewer, by whom it was operated upon.

Case I.—H. G., aged twelve years, schoolboy, admitted September 30, 1898. History is of nine days' duration. The boy first complained of pain in the abdomen, below and to the right of the umbilicus, and of weakness. Three days ago abdominal distention was noticed, and since then there is marked constipation. The distention and pain have increased, and the boy suffers from dyspnœa.

On admission the temperature was 100.6°. The status in short was the following: Superficial abdominal and thoracic veins distended. Liver: upper border of dulness at fifth space, lower border undetermined. Abdomen much distended, signs of free fluid. Across the hypogastric region and extending into the pelvis there is a nodular tumor, concave above. Rectal examination revealed a large bulging mass anteriorly.

Operation, on October 1st, by Dr. Van Arsdale. The peritoneum was found lined with white nodular masses, and a large amount of chyliform fluid escaped. After the operation the boy gradually became weaker, there developed a left-sided empyema, purulent peritonitis, and otitis media. He died on October 29th.

Post-mortem Examination. (Abstract.) Lungs: large purulent exudate in left pleura. Small abscess in base of left lung. Infiltration of the diaphragm and base of the left lung by new growth. Evidences of healed tuberculosis in the right lung. Spleen: infiltrations on surface.

Kidneys: in the medullary rays brown streaks looking like uric acid infarcts; growths on anterior surface. Pancreas: diffusely infiltrated. Liver: size normal; fatty; covered by flat growths, white in color, some of which involve the parietal peritoneum. The wall of the gall-bladder is uniformly infiltrated. The omentum and mesentery are very much thickened, due to infiltration by tumor masses. The mesenteric nodes are all very large, and on section are white, homogeneous, and dry. Stomach: walls diffusely infiltrated. Intestinal coils are bound together, by masses between which are sacculations of green pus. The parietal peritoneum is not involved, except over the liver. The intestinal coils are attached to the bladder by some of the growths. The walls of the colon and part of the ileum show a thin infiltration with the new growth, the mucosa not being involved. In the duodenum, eight centimetres from the pylorus, is a large growth which encircles the gut, and projects into its lumen. The growth measures seven centimetres in length, five in width, and six in thickness. It encircles the gut, and projects into its lumen; the mucosa is intact. Microscopical examination: lymphosarcoma. (Some of the details of the microscopical findings will be given later.)

NOTES. In this case of sarcoma of the duodenum, with extensive metastases, there existed stenosis of the intestine, which, as we shall later see, is the exception to the rule. The case was sent into the hospital with the diagnosis of "appendicitis." The diagnosis made in the hospital was "new growth of the peritoneum, probably sarcoma."

CASE II.--A. R., aged three and one-half years, admitted December 23, 1898. History of eight days' standing. The child complained of abdominal pain, and the abdomen was seen to be enlarged and rigid. Bowels moved freely, but there was difficulty in urination. During the last three days the child vomited several times, and was feverish. The feet were not swollen.

The physical examination revealed the following: The liver flatness begins at the sixth rib, and extends four centimetres below the free border. Spleen is enlarged to percussion. The right side of the abdomen is occupied by an irregularly-shaped mass extending to the median line, easily pushed about, moving freely with respiration. The lower limit seems to be at the umbilicus. The surface feels irregular, as if the mass were composed of lymph nodes. The abdomen is symmetrically distended. There are some hard, round masses to be felt just above the groins. Temperature 100.8°.

25*th*. Urine contains considerable indican. Catheterization found necessary. Blood examination shows a moderate secondary anæmia and moderate polynuclear leucocytosis.

31*st*. Abdominal distention more marked. Intense dyspnœa.

January 5th. Operation by Dr. Gerster. Peritoneum found very much thickened. Some ascitic fluid escaped. The intestines were found adherent to each other, and to the omentum. The patient died on the following day.

Post-mortem examination showed the following changes: Lungs: large effusion of clear fluid in the left pleura. Abdomen: very much distended. The mesentery and omentum are everywhere thickened and whitish. All the intra-abdominal lymph nodes are enlarged, some being

four centimetres in diameter. On section they are white, succulent, soft. In the beginning of the ileum there is a large, white tumor infiltrating the wall, especially opposite the mesenteric attachment. The main tumor mass measures seven by eight centimetres, and is about three centimetres thick. On opening the intestine the growth is found to be indurated, and has an elevated irregular edge. Except for a few small areas of necrosis the mucous membrane is intact. The part of the ileum involved is considerably dilated, the circumference there being three times as great as that of the uninvolved part of the intestine. There is also an infiltration of the wall of many of the intestinal coils, and the coils are adherent to each other. The iliac lymph-nodes are very much enlarged and adherent to the bladder wall, which is much thickened and nodular. The ureters are partially obstructed by the tumor. The parietal peritoneum is involved, but to a lesser degree than the mesentery and omentum. Spleen: moderately enlarged; few nodules on the surface; slight infiltration along the vessels coming from the hilus. Pancreas: entirely infiltrated and very much enlarged. Kidneys: normal in size; cut surface yellowish. In the left kidney there are a few small nodules. The pelves of both kidneys are somewhat dilated, the left more than the right. Left adrenal entirely replaced by new growth, and adherent to the pancreas. Stomach: wall whitish and thickened. Liver: very much enlarged. Almost the whole right lobe is light brown in color, and is separated from the normal liver tissue by a raised edge. This lighter part is hard on section, and appears to be uniformly infiltrated by new growth. There are also a number of small, hard nodules present. The liver as a whole is somewhat fatty. Gall-bladder: distended with a colorless mucoid fluid; the neck of this organ is much thickened by new growth, and the cystic duct is impassable. Appendix is eleven centimetres long; the wall is much thickened and uniformly infiltrated with new growth. Bronchial nodes present the same appearance as the intra-abdominal nodes. Microscopical examination: lymphosarcoma.

NOTES. This second case is an instance of a primary intestinal sarcoma with dilatation and with the most extensive metastases yet reported. The diagnosis before operation wavered between sarcoma of the kidney, tubercular peritonitis, and sarcoma of the peritoneum, with a possible primary intestinal tumor. The clinical history, except for the bladder symptoms, was rather typical.

CASE III.—M. G., aged eighteen years; Russia; admitted January 22, 1899. History is of one day's standing; began with abdominal pains, most marked on the right side below the umbilicus. Bowels moved yesterday. Has been vomiting since last night, vomitus being bile-colored. No history of any previous attacks. Status: Hippocratic appearance; breathing rapid and shallow; pulse almost imperceptible; legs drawn up; abdomen tense and hard, uniformly tympanitic. By rectum a large doughy mass is felt high up. *Operation* by Dr. Van Arsdale. Saline infusion. The abdomen was opened in the right iliac fossa, and a large amount of fluid, fecal matter, and serum poured out. The appendix was found normal. The abdomen was then opened on the left side, and the peritoneal cavity irrigated.

Temperature on admission 103.6°, respirations 50, pulse 100, almost imperceptible. Freely stimulated. After operation pulse rapidly gave out.

The *autopsy* showed the following: In the jejunum, one and one-third metres from the duodenum, is a perforation in the intestine measuring seven by eight centimetres in diameter, with an irregular edge. The perforation is due to a tumor which has infiltrated the wall of the intestine and dilated it. The growth is white and soft on section, and varies from one-half to two centimetres in thickness. The tumor surrounds the circumference of the intestine, except for a space of three centimetres on the mesenteric side. Just above the tumor in the mesentery anteriorly is a node which looks cheesy. Posteriorly there is a lymph node infiltrated with sarcoma. There were no metastases found.

Microscopical examination of the tumor and the infiltrated nodes shows lymphosarcoma.

NOTES. This unique case is an instance of intestinal sarcoma which produced no marked symptoms until perforation occurred. The diagnosis of general peritonitis, probably due to perforation of the appendix, had been made.

CASE IV.—M. M., aged forty-two years, admitted January 8, 1900. For the last two weeks the patient has had irregular abdominal pain. During the past week he has suffered from frequent urination. No blood was passed, nor was there a urethral discharge present. Four days ago he was seized with severe abdominal pain, especially marked in the pelvis. There has been absence of fever, chills, and vomiting. The bowels were constipated until yesterday, although cathartics and enemata had been used. Within the last four days the patient has noticed a mass low down in the abdomen, which has grown rapidly and has become very tender.

The physical examination of the emaciated patient revealed an irregular tumor in the hypogastric region, extending into both iliac fossæ, especially the right. The tumor is quite tender, rather hard, but gives the sense of deep fluctuation. The rectal examination shows a hard symmetrical bulging. The temperature was 101.4°; the urine contained albumin, pus cells, and hyaline and pus casts.

Operation on day of admission by Dr. Brewer. On opening the abdomen a very large hemorrhagic tumor was found springing from the ileum and adhering to the right iliac wall, the floor of the pelvis, the large vessels, and the bladder. After much difficulty the tumor, together with two inches of the small intestine, was removed, and a Murphy button anastomosis performed. The patient died three days later from acute peritonitis.

The description of the tumor is as follows: It springs from the ileum at a distance of seventy centimetres from the valve. At its point of attachment to the intestine there is a beginning diverticulum. The tumor is very irregular in shape, and consists in general of two more or less reniform parts. The greatest width of the tumor is fifteen centimetres, the length thirteen centimetres, and the thickness eight centimetres. One-half of the growth is entirely hemorrhagic and cystic,

and the other half is necrotic and cystic. On cutting the tumor open it is found to begin in the submucosa, reaching to the mucosa, but not involving it. Microscopical examination: spindle-celled sarcoma.

Of the *autopsy* notes only the following are of special interest: The spleen shows acute inflammation and hemorrhages. The kidneys show chronic nephritis, with acute degeneration. In the liver there is a marked pigmentation presumably due to absorption of blood from the tumor. There are no metastases present.

NOTE. This case was one of a solitary tumor of the intestine, which clinically bore the closest resemblance to acute appendicitis, the acuteness of the symptoms being due in all probability to the hemorrhagic extravasation.

ETIOLOGY. *Frequency.* A glance at some statistics will be necessary to show the frequency of sarcoma of the intestine, and the comparative frequency of sarcoma and carcinoma. From 1859 to 1875 there was no case of intestinal sarcoma observed in the Berlin Pathological Institute. On the other hand, Smoler reports thirteen cases in Prague in fifteen years among thirteen thousand and thirty-six autopsies. Nothnagel states that in twelve years there came to autopsy in Vienna twelve cases of intestinal sarcoma. This certainly indicates that the disease is an unusual one. Possibly the occurrence of four cases of lymphosarcoma in our service in a very short time would tend to show that we may have to deal with an endemic disease, for, as we shall later see, there is reason to suspect these tumors to be of infectious origin.

Compared to the total number of lymphosarcomata the intestinal cases are not very infrequent. Nothnagel's figures show that among two hundred and seventy-four sarcomata three involved the intestine, and of sixty-one lymphosarcomata nine were primary in the intestine.

As to the frequency compared to carcinoma, Mueller reports five hundred and twenty-one cases of carcinoma, of which forty-one occurred in the intestine, and one hundred and two cases of sarcoma, with only one instance of intestinal involvement. Similarly, Nothnagel's figures show that among two thousand one hundred and twenty-five carcinomata two hundred and forty-three occurred in the intestine; of two hundred and seventy-four sarcomata three occurred in the intestine, and among sixty-one lymphosarcomata there were nine of the intestine. So that sarcoma of the intestine is much more uncommon than carcinoma.

Location. Sarcomata have their seat of preference in the small intestine. In the large intestine they are much more uncommon, except in the rectum, where they occur quite as frequently as in the small intestine. A few figures will illustrate this. Krueger gives the following statistics of thirty-seven cases: Small intestine, sixteen; ileum and

cæcum, one; cæcum, two; appendix, one; transverse colon, one; small and large intestine, one; rectum, sixteen. Nothnagel's figures are as follows: Of nine lymphosarcomata one involved the duodenum; three the jejunum; three the ileum, and two the cæcum. Of three sarcomata one occurred in the ileum; one in the cæcum, and one in the rectum.

Age. Baltzer states that 58 per cent. of the cases occur in the fourth decade, and in eleven of his fourteen cases the age was not over forty. I have collected fifty-one cases in which the age is noted. The results are as follows: First decade, six; second, nine; third, thirteen; fourth, thirteen; fifth, eight; sixth, one, and seventh, one. This shows that the age cannot be used as a diagnostic point. The oldest patient was seventy (Smoler). The youngest was a congenital case reported by Stern. This case was that of a child which died when five days old with symptoms of intestinal obstruction. There was found at autopsy a round-celled angiosarcoma of the jejunum.

Sex. Baltzer's cases, with one exception, were all males. I have collected fifty-nine cases including Baltzer's. Among these we find thirty-five males and fourteen females; or, in other words, the disease seems to be more than twice as common in males as in females.

Cause. As to the causation but little is known. In several instances the disease developed after a trauma, the usual interval until these symptoms developed being five to six weeks (Jalland, Pepin). In one case there is a previous history of syphilis. In another (Nothnagel) it followed a tuberculosis of the intestine. Flexner, in reporting two cases, drew attention to a histological feature of the growth, which he believed might throw a hint as to the cause of lymphosarcoma. He found in the growth in the stomach, intestine, and kidneys (most distinctly in the last) certain peculiar bodies. These were oval, round, or slightly irregular in shape, and consisted of a rim of protoplasm staining faintly with eosin, and enclosing a particle staining with hæmatoxylin. The last was oval or crescentic, and lay either in the centre of the cell or eccentrically. The bodies were distributed irregularly in the diseased areas, and an occasional body was seen in the adjacent parts. Flexner believed that they were probably protozoa, but stated that they might have no causal relationship.

I have found these bodies in the sections from the involved organs in our cases of intestinal lymphosarcoma, and also in specimens from other cases of lymphosarcoma. Although in places they at first impress one as probably being fragments of cells disintegrated by the infiltration of the new growth, a careful examination shows that such a view is not tenable, and one must agree with Flexner's view that they are at least suspicious.

PATHOLOGY. *Location and Size.* I have collected forty-two cases in which the location is given. Of these, fifteen occurred in the duod-

enum; eighteen in the jejunum; two involved the jejunum and ileum; fourteen the ileum, and three the entire intestinal tract. These figures show that the larger number of sarcomata occur in the jejunum and ileum, but they may be located anywhere. The tumor may be single or multiple, small or large.

Varieties. The varieties of tumor found are: spindle-celled sarcoma, lymphosarcoma, myosarcoma, endothelioma interfasciculare, round-celled sarcoma, melanosarcoma, and mixed-celled sarcoma. Some round-celled sarcomata might better be classed with the lymphosarcomata.

When sarcoma occurs in the intestine it is generally primary there. It may, however, be secondary, or it may be part of a general lymphosarcomatosis. In this article we shall direct our attention to the primary cases only. In most of the cases the growth is confined to the mucosa and muscularis, and the serous coat is entirely or nearly entirely free. In a very few instances the growth began in the serosa, and later involved the inner coats. The lymphosarcomata, which formed the largest group (seventeen cases), generally begin in the submucous lymphatic nodules, and have a tendency to grow longitudinally. The muscularis is early infiltrated and paralyzed, and the feces dilate the intestine. This dilatation is a peculiar though not a constant feature of intestinal lymphosarcoma.

METASTASES. I have arranged these according to the character of the growth. Among the cases reported with microscopical examination there are five instances of spindle-celled sarcoma. Four of these had no metastases; one had metastases in the peritoneum and liver. The location of the tumor is not always given, but one was in the ileum, and our case was also in the ileum. Of the lymphosarcomata (seventeen cases) three involved the duodenum; four the jejunum; three the ileum; one the appendix; one the ileum and jejunum, and one the whole intestinal canal. Metastases occurred as follows: In three cases there were none; in most of the cases the mesenteric nodes and other parts of the intestinal walls contained growths. The liver was involved seven times; the kidney seven times; the spleen three times; the pancreas once; the adrenals once; the diaphragm twice; the rectal wall twice, and the bladder four times.

Among the numerous other reported cases we will give details of a few only. In the case of Nicolaysen (myosarcoma) a few nodes in the mesentery were involved, and in Lehmann's case of endothelioma the whole intestine except twelve inches was involved. Of the round-celled cases (four) two involved the jejunum and two the ileum. In one case there were no metastases; in another there were growths in the mesentery, and in the third the kidneys and upper part of the rectum were infiltrated. In Treves' case of melanosarcoma of the ileum the inguinal glands were infiltrated.

These data all go to show that the spindle-celled sarcomata have few or no metastases. The lymphosarcomata generally have extensive metastases, every abdominal organ and tissue being liable to invasion. The superficial lymph nodes are not generally involved. The metastases occur most commonly in the peritoneum, lymph nodes, liver, and kidney. There is a marked tendency for the growth to occur in the pelvis or for the original tumor to become adherent there. In our first two cases the growths seem to have been more extensive than in any other cases hitherto reported. A careful examination of the specimens showed that the growth extended almost entirely by continuity, or by contact. In the liver the growth extended inward from the surface, or along the vessels. The spleen and kidneys showed the same.

The parietal peritoneum was implicated only by extension from the visceral peritoneum. This opposes the statements made about the discontinuous growths of the lymphosarcomata, and strengthens the impression that these growths are infectious in nature, and that we are not dealing with metastases in the true sense of the word.

Microscopical Examination. I shall confine myself here to a few notes of my own cases. The fourth case needs but little commentary. In the other three cases the picture was that of a typical lymphosarcoma. I might mention, however, the great number of large lymphatic capillaries in some of the growths, and the frequent occurrence of the growth in the lumina of these capillaries.

In the first case the main growth was found in the submucosa, and through slits in the muscularis mucosæ the sarcoma cells reached up between the tubules. In some places the muscularis was entirely replaced by new growth. In the mesentery, omentum, and intestinal wall the tumor seemed to pass along under the serosa. The mucosa of the intestine above and below the growth showed no particular changes. The liver showed acute degeneration and congestion. The infiltrations in it followed the vessels, and tended to surround the lobules. There was some increase of the connective tissue between the lobules in the parts of the organ which were not infiltrated. The capsule was distinctly thickened. In the kidneys there was present a marked degeneration and congestion.

In the second case the sarcoma cells could very frequently be seen in the lymphatics. The liver showed fatty degeneration and infiltration and acute congestion. The growth seemed to spread between the liver cells, and at the edge of the infiltration the liver cells were almost entirely replaced by fat, or appeared to be necrotic. Near the growth the bloodvessels were much dilated. At a distance from the growth there was a marked parenchymatous degeneration, but less fatty infiltration. In one place there were small calcific deposits. The spleen was congested and hemorrhagic. The infiltration spread

here also along the connective tissue and around the vessels, and there could frequently be seen an infiltration about the vessels in the Malpighian bodies. In the kidneys there was found an acute congestion and degeneration. The infiltration occurred between the tubules, and in the areas involved the tubular epithelium was very indistinct. The stomach was diffusely infiltrated, even the mucosa being involved. In the gall-bladder the infiltration involved the submucosa only. The mucosa of the intestine above and below the primary growth for a short distance stained homogenously and showed no distinct structure.

In the third case there was a cheesy gland in the mesentery, but microscopically this proved to be lymphosarcomatous in nature. In the fourth case we will note only that the liver was markedly pigmented, that the kidney showed an acute parenchymatous degeneration, that the spleen was acutely inflamed and hemorrhagic, and that the heart presented a brown atrophy.

I have given the microscopical report of these cases to bring out the following points:

1. The transmission alongside the vessels, and the growth in the lymphatics in the lymphosarcoma cases.

2. The marked degeneration in those portions of the liver next to the new growth. Schulz (*Archiv für Heilkunde*, Band xv., p. 193) cites several instances of lymphosarcoma of the liver, stomach, intestines, and kidneys in which the epithelium near the growths was swollen, very granular, often fatty and disintegrated.

3. The parenchymatous degeneration of the liver and kidneys as a whole. In our second and fourth cases this must be explained as being due to the absorption of toxins or allied substances from the growths, and this again points to their probable infectious nature.

4. The fact that a cheesy gland may be lymphosarcomatous (*infra*).

5. The brown atrophy of the heart in the last case indicates a long continuance of the growth before the occurrence of distinct symptoms.

Flexner noted in his two cases extensive atrophy of the mucosa of the entire intestinal tract. In our case no such change was present, except to the slight degree noted in the second case.

Results of the Growth. (*a*) *Dilatation and Stenosis.* As pointed out by Kundrat, Treves, and Baltzer the lymphosarcomata cause dilatation of the intestine. This may be aneurismatic in form, as in the cases of Haas, Bessel-Hagen, and in our second case. Occasionally the tumor causes stenosis, but there is no case on record of complete stenosis due to obturation of the lumen by the tumor. Rutherford stated that the higher up the tumor lies the less likely is there to be stenosis. But we have noted that the stenoses have been found most commonly in the sarcomata of the duodenum. When a complete obstruction has been found it has been due to one of the following causes:

(1) Invagination (Wallenberg); (2) twisting of the mesentery, due to the tumor being caught in a hernial sac (Waldenström); (3) adhesions (Schmidt). The tumor may be attached to the intestine by a pedicle, as in Lannelongue's case. In our fourth case the tumor had produced a small diverticulum in the wall by traction.

(*b*) *Results of Compression.* The tumor may compress:

1. The vena cava, causing œdema of the legs and ascites.

2. The bile ducts, and pancreatic duct (Lancereaux, sarcoma of the duodenum). In our second case the cystic duct was obstructed.

3. Ureters. This occurred in our second case, and resulted in a hydronephrosis of a moderate grade.

(*c*) *Ulceration and Perforation.* Ulceration is quite common, and may result in perforation, such perforation being either closed off by intestinal coils, the bladder or rectum, or opening directly into the general peritoneal cavity. The perforation may occur in any part of the intestine. The ulceration may expose vessels (Rolleston, sarcoma of the duodenum, erosion of the inferior pancreatico-duodenal artery). It is possible for these tumors to rupture without ulceration (Zuralski).

(*d*) *Changes in Other Parts of the Body.* The general changes and metastases have been described above. The pleural cavities may contain clear fluid or pus. There may be a localized or general peritonitis, the effused fluid being chyliform, clear, purulent, or hemorrhagic. There are practically no reports of a careful examination of the effusions in these cases. In the case reported by Henoch the fluid was hemorrhagic and contained numerous round cells showing fatty degeneration. We shall later give the details of the fluid in our fifth case.

(*e*) *Connection with Other Diseases.* In one case there was found a mixed-celled sarcoma of the ileum and an adenocarcinoma of the pylorus (Smoler). More important is the fact that lymphosarcoma has frequently been found in persons having either an intra-abdominal tuberculosis or a florid or healed tuberculosis elsewhere. The exact connection is not understood. While not attempting to state that a combination of tuberculosis and lymphosarcoma is not frequent, we believe that only cases in which a microscopical examination is reported should be credited, for just as Sternberg has shown, that a lymph node that looks lymphosarcomatous macroscopically may be tubercular on microscopical examination, so I have shown that the opposite mistake can be made.

Symptomatology. *General Description.* Nothnagel gives us a good outline of the disease when he states that there is very early and without exception a marked affection of the general system and but few local symptoms. Baltzer's description, which has been quoted in most of the books, is as follows (abstract): "The symptoms are very slight at the onset. There is at first pain in the stomach, loss of appetite, nausea, vomiting; the bowels are irregular, being either constipated or

loose. The abdomen soon becomes distended. When seen early all the patients are very thin and have a pale color. A tumor is generally found, although it may be missed for a long time; it may be located in any part of the abdomen, and it is generally but slightly or not at all tender. The temperature is normal or moderately elevated. In some cases there is a leucocytosis. The duration of the disease varies from two weeks to one and three-quarter years, but most of the patients died within nine months."

Detailed Symptomatology. *Pain* is present in practically all the cases. It may be mild or severe, and may be located in any part of the abdomen. In most cases the pain is referred to the stomach, and occasionally it is especially marked after meals. In three of our cases the pain was specially referred to the region of the appendix.

Distention of the Abdomen is very common, being uniform or irregular. Its onset is frequently sudden, and the symptoms of the disease may date from its appearance. The swelling may rapidly increase or remain at a standstill, later to become suddenly more marked. The distention is due either to involvement of the peritoneum, pressure on the vessels, perforation of the intestine, tympanites, or the size of the tumor. If fluid is present it may be clear, chyliform, purulent or hemorrhagic. In our first case it was chyliform, in the second clear, and in the third fecal. In the fifth case a paracentesis abdominis was made, and the fluid showed the following: It was cloudy, yellow, odorless; its specific gravity 1014. There was present a trace of urea; albumin, 0.12 (.1290) per cent. Microscopically there were found a large number of pus-cells, red blood-cells, and some epithelial cells, numerous cocci and bacilli. Culture showed the bacterium coli commune.

Characteristics of the Tumor. In some cases a tumor cannot be made out. If a tumor is discovered it may be first found by examination, or it may be the symptom which leads the patient to consult a physician. After the tumor is once there it may grow very rapidly. The growth may be large or small, single or multiple. The lymphosarcomata often feel like one irregular tumor, whereas in reality the growth in the intestine is very small, and the irregularity is due to growths in the peritoneum and lymph nodes. At times small nodules are found which feel like lymph nodes, but which on post-mortem examination prove to be infiltrated appendices epiploicæ. The tumor may be superficial or deep. It may be possible to feel one large tumor and scattered nodules all over the abdomen, some feeling as if they were in the parietal peritoneum. Such an observation was made in our second case.

The tumor is generally only slightly or not at all tender. Marked tenderness occurred in only one of our five cases. The growths usually move with respiration, and can generally be moved around in the abdo-

men. The note over them is generally dull or dull tympanitic. Their consistency is generally moderately hard, although very soft and very hard ones have been described. The centre may show indistinct fluctuation, as in our fourth case. Crepitation may be felt over the tumor, and the latter may be seen to take part in the peristaltic movements of the intestine.

The position of the mass is most variable, but a large number of them tend to grow downward, or the growth occurs primarily in the lower part of the abdomen. As a result a rectal examination may reveal a tumor when nothing or only small nodules can be felt in the abdomen. In three of our cases parts of the growth could be felt by the rectum.

Symptoms Due to Compression. These may be summarized as follows: 1. Ascites or œdema of the legs and scrotum, the latter two being important symptoms. 2. Distention of the veins of the abdominal and thoracic walls. 3. Jaundice and alcoholic stools. 4. Dysuria and diminution in the amount of urine.

Gastric Symptoms. Loss of appetite and vomiting are of frequent occurrence. The vomited matter may contain bile, especially if the tumor is high up, but vomiting of blood is exceptional, except when as a terminal symptom. In our fifth case hæmin crystals were found in the vomitus comparatively early in the disease. In Stern's congenital case meconium was present. The gastric pains have been referred to.

Intestinal Symptoms. There is generally some disturbance in the movements of the bowels, although the exact character varies. Thus there may be always constipation or always diarrhœa. There may be first constipation, and then diarrhœa, or they may alternate. More characteristic is an early diarrhœa followed by persistent constipation. The constipation is not absolute, except when some complication is present, as already referred to. Rarely "erections of the intestine" may occur (Schmidt). The movements may contain pus and blood, although the admixture of blood generally speaks for involvement of the large intestine.

Hepatic Symptoms. The liver has generally been described as not being enlarged, but in three of our cases there was quite marked increase in size. Rarely jaundice is present.

Pulmonary Symptoms. Dyspnœa is not uncommon, being due to pleural effusions, the abdominal distention, or the weakness and anæmia. The pleural effusion is bilateral or unilateral, and the fluid is serous or turbid or hemorrhagic.

Urinary Symptoms. The urine may be scanty and contain much urates. Albumin is frequently present, pus and blood rarely. There may be difficulty in urination of even marked degree, as in our second case. The urination may be very frequent and painful.

Cutaneous Symptoms. Sweating is not uncommon, especially at night.

The œdema of the legs and scrotum, due to pressure or hydræmia, may occur quite early. There may even be a general slight anasarca. The veins of the abdominal wall and thoracic walls may be prominent. Of great importance is the appearance of a peculiar white color in the face, which may come on suddenly, and usually appears after the abdomen is distended. This rather characteristic color appeared in our first two cases very early, but in the fifth case it was first noted a few days before death.

External Lymph Nodes. These are not generally enlarged. But in a case of melanosarcoma of the ileum, reported by Treves, there was a swelling in the left groin which was suspected of being a hernia, but which proved to be a lymph node containing metastases.

Temperature. The temperature may be quite normal throughout the disease, but is more common to find evening rises to 101°, 102°, or 103°. Our cases all had febrile movements.

Emaciation and marked loss of strength are generally prominent features. They were present in all our cases, but developed in the fifth case very late.

Blood Changes. Here there is nothing characteristic, although anæmia and leucocytosis have been described. Schmidt made a careful examination of the blood in two cases, and noted in both a diminution in the amount of fibrin and an increase in the number of hæmatoblasts. In our second case an examination showed a moderate secondary anæmia, with slight polynuclear leucocytosis.

Course of the Disease. A consideration of the symptomatology as just given will show that the descriptions given by Baltzer and Nothnagel will not fit many of the cases. I have therefore endeavored to classify the varieties of the disease in the following way:

1. Latent cases, the disease being first discovered at autopsy.
2. Cases with the clinical picture described by Baltzer, either the general symptoms, the distention of the abdomen, or the tumor being first noted.
3. Cases in which the first symptoms are due to an intussusception or other variety of intestinal obstruction or to perforation.
4. Cases resembling tubercular peritonitis.
5. Cases in which jaundice is the first symptom.
6. In one case there was the closest resemblance to an ovarian cyst.
7. Finally, the cases may bear a very close resemblance to appendicitis, an observation made for the first time in our cases.

Diagnosis. Of all the symptoms just detailed the following are important for the diagnosis: the presence of a tumor (rectal examination) which is not markedly tender, abdominal distention, absence of symptoms of stenosis, early œdema of the legs, the lack of involvement of the external lymph nodes, the emaciation, the peculiar color, the absence

of marked ascites. But none of these symptoms is absolutely constant. It is very difficult to establish any exact rules for diagnosis, as any one observer is apt to see but few cases. We shall endeavor to give a few hints and to indicate the diseases with which intestinal sarcoma is most likely to be confounded, omitting the very rare conditions, such as actinomycosis or echinococcus disease.

The main question that arises is, Can these tumors ever be positively diagnosed? Undoubtedly in many cases it would have been impossible to make the correct diagnosis. We believe, however, that in a certain number of instances the correct diagnosis can at least be strongly suspected. If there is a large movable tumor present, or, better, one large and several small tumors, or, if beside, growths can be felt by rectum, with but little or no ascites, and with early œdema of the legs, and the peculiar color described, the diagnosis of sarcoma of the mesentery or omentum is very probable. If these symptoms occur in a person under fifteen the diagnosis is still more probable. Having made a diagnosis of peritoneal sarcoma, and the tumor being movable, the existence of a primary intestinal sarcoma must be strongly suspected, and can be made positively if there exist early in the case intestinal disturbances, or if the colon bacillus can be isolated from effused fluid, if such be present (as in our fifth case). Of course we can never say positively that the tumor is not primary in the mesentery. However, as far as treatment is concerned, there is no importance in this distinction.

The following are the diseases to be differentiated:

1. *Carcinoma of the Intestine and Peritoneum.* Baltzer states that sarcoma occurs earlier in life, that carcinoma is apt to produce a stenosis earlier, is more tender, and lasts longer. Schmidt believes that œdema of the legs, with little or no ascites, would favor sarcoma. This latter statement is certainly true. Baltzer's remarks are, however, not absolutely correct. We shall later see that, although sarcoma is usually rapid in its course, it may be slow, and there are numerous instances in which carcinoma runs a rapid course. Again, we have shown that sarcoma does occur after the fortieth year, although not commonly. According to our personal experience, carcinoma of the intestine occurs quite frequently in people between the ages of fifteen and twenty-five. It is true that it then generally involves the cæcum, descending colon, or rectum, but if metastases are already present (and it is mainly under such conditions that the differential diagnosis must be considered) the cases might well be confused with sarcoma of the intestine. We will therefore modify Baltzer's statement, and say that under fifteen years of age the diagnosis would be decidedly in favor of sarcoma (although it is true that even congenital intestinal carcinoma has been described as well as congenital sarcoma), and that after the age of forty sarcoma is less probable but cannot be excluded. Important points against the

diagnosis of carcinoma are the absence of external glandular involvement, the absence of tenderness, and the large size of the growths in the sarcoma cases.

2. *Tubercular Peritonitis, and Tuberculosis of the Mesenteric Lymph Nodes.* The differential diagnosis may be very difficult, and even if a positive diagnosis of sarcoma is made the presence of a concomitant tuberculosis cannot be excluded. This was made especially clear in a case described by Nothnagel, in which his diagnosis wavered between these two conditions, and in which the autopsy revealed lymphosarcomatous growths, springing from the edges of cicatrizing tubercular ulcers. The presence of a very large tumor or tumors speaks more for sarcoma. The facies is different in the two conditions, but the recognition of this point requires much experience. Ascites is more apt to occur early in tuberculosis. A tubercular history is of no use in excluding sarcoma, nor is the existence of fever. If the ascitic fluid should reveal tubercle bacilli of course the diagnosis of at least a tubercular condition being present would be absolute.

3. *Intestinal obstruction, intussusception or intestinal perforation when due to sarcoma,* is accompanied by the same symptoms as under other conditions, and the diagnosis can be made only if the growths can be felt and if other symptoms are present.

4. *Sarcoma of the kidney* is not generally so mobile. Hæmaturia would speak decidedly for a renal growth, but this does not occur in the majority of cases. In renal sarcomata the tumor is generally located more on one side of the abdomen, but this may also occur in intestinal sarcoma. If nodules are felt elsewhere in the abdomen they speak for intestinal or mesenteric sarcoma, as the renal cases do not show metastases in the peritoneum. Further, the kidney sarcomata are less rapid in their course.

5. *Ovarian Tumors and Cysts.* A pedunculated intestinal growth may closely simulate an ovarian cyst, and, on the other hand, an ovarian tumor may be located in the upper part of the abdomen, and simulate a mesenteric or intestinal tumor. The finding of a pedicle (Hegar's method) springing from the uterus would make the diagnosis clear. In a case recently seen no pedicle was felt (Hegar's method not being tried), and as the tumor was surrounded by a group of distinct nodules the diagnosis of intestinal or mesenteric sarcoma seemed assured. The operation, however, revealed an endothelioma of the ovary, and what had appeared to be separate nodules were found to be large irregularities springing from the tumor.

6. *Neoplasms of the Bladder and Prostate Gland.* Given a large tumor in the region of the bladder or prostate, especially in a person under forty, it is necessary to determine whether or not the same is

due to a secondary growth from an intestinal sarcoma or is a primary intestinal growth which has become adherent in the pelvis. In two of our cases some of the symptoms might easily have been construed as indicating a primary growth of the bladder.

7. *Retroperitoneal Sarcoma.* The differential diagnosis may again be very difficult here, although unimportant, for an intestinal tumor extensive enough to resemble one of these retroperitoneal sarcomata is generally a non-operable case. We cannot enter into a description of these sarcomata here, but would refer to a review of the subject by Steele, in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, March, 1900, page 322. He says that in retroperitoneal sarcoma the colon lies in front of the tumor, that obstruction of the intestine is apt to ensue, and that pain in the legs and in the lumbar regions is characteristic.

8. *Appendicitis with or without Peritonitis.* Our third and fourth cases show how closely this may be simulated by an intestinal sarcoma (and it is not difficult to appreciate how much greater this similarity might be in cases where the sarcoma is primary in the cæcum). The diagnosis will have to be made on the lines laid down until more cases are reported. I would lay great stress, however, on the attempt to find nodules by rectal examination. A single mass felt by the rectum is not of much use for differentiating the conditions, as such a finding is frequently enough made in appendicitis cases, and it not uncommonly occurs that a separate, very hard mass closely resembling a tumor may be felt by the rectum in cases of appendicitis.

9. *Differential Diagnosis Between Lymphosarcoma and Other Varieties of Sarcoma.* This cannot at present be made with any degree of certainty; all we can now say is that with spindle-celled sarcomata there is apt to be one large mass, whereas the lymphosarcoma cases usually present multiple growths.

EXPLORATORY LAPAROTOMY. We believe that this is indicated in all cases except in those in which there can be felt several distinct masses at some distance from each other. A large mass with nodules nearby may represent a solitary tumor only, as was demonstrated in the case of ovarian endothelioma cited above.

DURATION AND PROGNOSIS. Baltzer puts the duration at from two weeks to one and three-quarter years, most cases dying within nine months. This statement is corroborated by the cases since reported with the exception of a case described by Rutherford, which was of two and one-half years' duration. In our third case the history was only of one day's duration, but the statement made by the relatives that the patient had slight pains in the stomach for three months, although he continued at work, must be taken to indicate a longer existence of the illness.

The prognosis seems to be almost invariably fatal. A number of these cases have been operated on, and some, it is claimed, with a favorable result, but the ultimate outcome of the cases has not been given. In only one instance—a case reported by Babes and Nanu—was the patient alive after one year, and the authors themselves state that the ultimate outlook was bad. The other operated cases are as follows: Nicolaysen: spindle-celled sarcoma; recurrence in twenty-four days. Zuralski: cystic sarcoma; recovery for the time being. Lannelongue: variety of tumor not given; ultimate result not stated. Heinze: resection of 110 cm. of the intestine with mesentery; recovery, but ultimate result not given. Among Baltzer's cases there are four in which death resulted within twenty-four hours after operation. Siegel has recently reported a case of lymphosarcoma for which he resected 30 cm. of small intestine, but death resulted within two weeks. Van Zwalenburg (verbal communication: case to be presented at the meeting of the American Medical Association, June, 1900) has operated on a case, the patient being alive now, seven months since the time of operation.

TREATMENT. (*a*) *Operative.* When the growth can be removed completely this should certainly be done; but we believe that cases of lymphosarcoma with extensive metastases should not even be subjected to exploratory incisions, as this is likely to hasten the occurrence of the fatal issue.

(*b*) *Medicinal.* In the literature there are a number of undoubted instances in which sarcomata, particularly lymphosarcomata, have been cured or improved by arsenic given internally, used hypodermatically, or parenchymatously (into lymph nodes). Such cases have been reported by Liebmann, von Ziemssen, Köbner, Billroth, Winiwarter, Tholen, Arning, and Wunderlich. In their cases there was generally present a multiple lymphosarcomatosis, or sarcoma of the skin. We believe that this treatment should invariably be tried in cases of intestinal sarcoma, and that it should be used also for the patients upon whom successful resections have been performed. Whether Coley's fluid would be of any value in these cases future experience alone can decide. The remainder of the treatment is purely symptomatic.

ADDENDA. Since writing the above my attention has been drawn to an interesting case reported by Lindner in the *Beiträge zur klin. Chirurgie*, 1899. This case was that of a man, aged thirty-six years, who six months before he came under observation was operated upon for a supposed carcinomatous ulcer of the head, and who for fourteen days was suffering from symptoms of ileus. There were present a marked enlargement of the lymph nodes on one side of the neck and a tumor in the right hypochondrium. At the operation an intussus-

ception of the small intestine was found, and the gut was full of lymphosarcomatous tumors. A resection was done, but the patient died after twenty-four days. Lindner believes that the tumor was primary in the intestine, and that the ulcer on the head, which had been supposed to be carcinomatous, was probably sarcomatous. He reports the case as an instance of a tumor whose metastases caused symptoms long before the primary growth was revealed, but does not state how long the tumors were present in the neck.

A case of intestinal sarcoma was reported to the Surgical Section of the New York Academy of Medicine by Dr. Weir, on May 14, 1900, for which he resected eight feet of small intestine. The patient lived for two days. Dr. Weir kindly allowed me to refer to this case before its publication in the Society reports.

Two further cases of lymphosarcoma occurred in the hospital in June, 1900.

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REVIEWS.

COLUMBIA UNIVERSITY BIOLOGICAL SERIES. Vol. IV. "The Cell in Development and Inheritance." By EDMUND B. WILSON. Second edition, revised and enlarged. New York and London: The Macmillan Co., 1900. Pp. xxi., 483, with 194 figures in the text.

THE importance of the cell theory in the medical sciences has been generally recognized since the appearance of Virchow's *Cellularpathologie* in 1858. Strange to say, however, medical men have paid extremely little attention to the cellular phenomena until within the last few years, and even now such attention is confined almost exclusively to certain cellular aspects of pathology. In this country, at least, medical education takes almost no account of the normal structure and functions of cells, and yet upon this very basis must rest any thoroughgoing knowledge of the animal body in health and disease. Verworn and Loeb have called attention to the necessity of a knowledge of cellular or general physiology if one is to arrive at any understanding of the fundamental properties of living things, and a similar claim may be made for cellular morphology. In fact, the cell theory of Schleiden and Schwann occupies a position in biology to-day second only to the evolution theory, and in some respects the former is even more fundamental than the latter, since the whole problem as to the mechanism and causes of evolution, inheritance, variation, assimilation, metabolism and irritability can be approached only from the stand-point of the cells.

To be sure, it is not absolutely essential that a physician should be trained in cytology in order to make diagnoses and write prescriptions. The structure or functions of nucleus or cytoplasm are of small concern to the man who is primarily interested in the art of applying to the recognition and cure of disease those principles which are already well established. On the other hand, a knowledge of cytology is indispensable to the medical man who is striving to extend the bounds of his science, and the history of medicine no less than the whole history of human advancement serves to show that no knowledge of fundamental phenomena is useless or without consequence.

The greatest danger in all recent scientific work is the outgrowth of the very principle which has made science most effective, viz., *specialization*. So great are the number of workers, and so rapid is the advance in every science, that it has become impossible for any one man to follow the whole advance of his own science. Louis Agassiz used to say that he pitied the man who would undertake to keep track of zoölogical literature fifty years after his day. There are few if any such men to-day either in zoölogy, botany, physiology, pathology or related sciences. Men are no longer naturalists, but helminthologists, ophthalmologists, cytologists, etc., and while the result of this specialization

has been such a rapid advance in the knowledge of individual facts as the world has not known before, it has failed to bring forth any such great principles as date from such old masters as Joh. Müller, Virchow, Sachs and Darwin.

There is no greater need in modern scientific work than facilities by which workers in any branch of science may in the briefest possible way become acquainted with the general stand of sciences other than their own. This is met to a certain extent by the many excellent *Berichte* and indices which summarize the work of each year in the various sciences; but even these are too extensive and technical for persons outside the particular science in question. Every few years there is need of some general work in each science which shall give in accurate and yet in generally intelligible form the present stand of that science. Fortunately this need is being met by the publication by eminent authorities of text- and reference-books in the various sciences. It is a pleasure to note that in this work, which is often burdensome and thankless, some of the greatest living authorities are engaged.

Professor Wilson's book on the cell, the second edition of which has just appeared, is a work of more than ordinary interest, not only to the cytologist, but to all persons who are interested in any of the biological sciences, It is not the first book in this field, though I think it may be said to be easily the best. Herwig's splendid treatise (*Die Zelle und die Gewebe*, 1893) was really the first general work in the field. Since then have appeared Henneguy's *Leçons sur le Cellule* (1896) and Häcker's *Praxis und Theorie der Zelle- und Befruchtungs Lehre* (1899). Wilson's work is limited, as, indeed, also is Henneguy's and Häcker's, to those cellular phenomena connected with development and inheritance in which at present knowledge is most advanced and interest most intense.

After an extremely suggestive introduction, in which the history of the cell theory and its relation to the evolution theory is discussed, the author, in successive chapters, treats of (1) cell structure, (2) cell division, (3) the germ cells, (4) fertilization, (5) chromatic reduction, (6) cell organization, (7) cell chemistry and cell physiology, (8) cell division and development, (9) theories of inheritance and development, while an excellent glossary, a general literature list and indices of authors and subjects are found at the close of the volume.

To those who are unacquainted with the recent developments of cytology some idea of the extent of work in this field will be conveyed by the statement that 820 papers are cited in this book, most of which have appeared during the past ten years. Almost every topic is taken up from the historical point of view, the present stand of the subject is then presented, followed by a discussion of the problems connected with it which are still unsettled. The whole of this is done with the accuracy and thoroughness of a piece of research; in fact, the work is in many ways a most important contribution to knowledge. For all this, it will prove none the less interesting and intelligible to the general reader who may be unacquainted with the recent developments of the cell theory.

The book is written in a lucid, almost picturesque style, and is so profusely and beautifully illustrated that it will certainly appeal to the general scientific public as well as to those who are more directly concerned with the subjects treated. E. G. C.

THE PRINCIPLES OF TREATMENT AND THEIR APPLICATION IN PRACTICAL MEDICINE. By J. MITCHELL BRUCE, M.A., M.D., F.R.C.P. Adapted to the United States Pharmacopœia by E. QUIN THORNTON, M.D. Philadelphia and New York: Lea Brothers & Co., 1900.

ONE can but wish that a healthy cynic with a sharp wit might brave criticism to-day, as Oliver Wendell Holmes did forty years ago in his "Currents and Counter Currents of Medical Science." He might force upon an unwilling band of empirical therapeutists the conviction that they do not differ widely from those whose teachings are so bitterly scorned, the pupils of him who taught that the itch was all-prevalent, and was to be cured only by taking a minute dose of the hair of the miserable canine that caused the affliction. It is true that the American eagle cannot scream so joyously to-day because of enormous doses, and that forty years ago the stars and stripes could wave more proudly—for three drachms of calomel are rarely given now at a single dose. But while heavy volleys are not often discharged at unfortunate patients, random shots come from many directions, fired with blind trust that they may hit something, since someone else, though he knows not why, has said that he has struck the mark.

The earnest work that has been done on the physiological action of drugs and the wonderful glimpses of rational treatment of infections that the bacteriologists have given us have driven blind empiricism into the background in the minds of thoughtful men, but the activity of those who have interests in proprietary preparations unites with the common eagerness for something new, and the two engulf us in a literature on drugs that is filled with contradictions and counter-assertions based almost exclusively upon the observation of symptoms, while the nature of the disease, its etiology, and its natural course receive little or no consideration. A warm welcome must await all works that meet this current and turn it backward, and Dr. Bruce has met it boldly with pathology as his strong mainstay.

The first part of the book may at first prove disappointing to those whose chief object in reading a work on therapeutics is to learn of new drugs which they may use in the chance of doing some good; but it is this part of the work that is most welcome of all. It meets the subject of therapeutics from a very unusual stand-point—264 pages are devoted to purely general philosophical considerations. The indications for treatment which may be gained from a study of the etiology of diseases are pointed out, and this is followed by a similar consideration of pathological indications, then by a discussion of clinical indications, and this by a valuable chapter on personal factors in their relation to disease. The latter part of this section deals with the question of the need or lack of need of interference in disease, and with the discussion of general means of treatment—food, rest, exercise, nervous influences, and the like. The section is closed with a discussion of the art of rational treatment in theory and in practice, and with a careful consideration of the proper mode of procedure in treating a case. A few of the statements in this last chapter may well be referred to: The first indication is to make a diagnosis of *the case* as distinguished from the disease, and to be prepared to treat *the patient*. After making a diagnosis, consider the course which the disease is likely to follow, review deliberately the etiological, pathological and clinical facts of the case, and determine the indications

furnished thereby. After this, one should consider the order in which the indications should be attended to; and we may see, as a guiding star, the italicized statement, "*let well alone.*" The final indication is to prescribe remedies only in a methodical way and with a definite purpose.

This part of the book does not consider the use of individual drugs for special purposes, and to some readers there may seem to be more words than practice in it; but if it were read by medical students before beginning their course in therapeutics, and by many practising physicians, they would be saved from the danger of falling into the slough of profitless empiricism.

The second portion is one of the most rational and practical discussions of the treatment of special diseases in existence, and evidences in all parts the experience of a thoughtful man. The treatment of various diseases is taken up first from the point of etiology and prophylaxis, next in relation to the indications furnished by the pathological alterations probably present, and after this the clinical phenomena are considered in connection with the treatment indicated. All these matters are gone over in their relation to the attendant's first visit. The author then discusses the course which the disease is likely to follow and the indications that may be met with at various periods of its progress. Complications and their management are considered, and treatment during convalescence receives a good deal of space. Finally, at the end of the section on each disease there is given a summary of the management of the case from the beginning to the end, which puts the whole matter at the service of even the busiest man. There are innumerable useful suggestions in this portion of the book. As an example may be mentioned the fact that Dr. Bruce devotes some time to the question as to what life work may be recommended for boys who have acquired heart disease in early life. Other similarly practical points are met with throughout this portion.

In parts the style is somewhat fanciful, as, for instance, in the first half, the description of the battle array of the phagocytes when they advance to meet the micro-organisms of disease, and their retreat when the enemy is present in too great strength; but this adds charm, even though it occasionally sacrifices a little scientific exactness. At times there is perhaps too much attention given to facts which are almost self-evident, but excessive space is only rarely used, and, as a rule, each page may be read with profit. D. L. E.

THE ANATOMY OF THE BRAIN. By RICHARD H. WHITEHEAD, M D. New York, Chicago, Philadelphia: The F. A. Davis Company, 1900.

AMERICAN anatomists, after waiting many years, seem to have become impressed with the idea that works on the anatomy of the nervous system are sadly needed. We had Gordinier's book, later Barker's more extensive work, and now the little volume by Whitehead appears. The last makes few claims. It has been written in the hope of giving to the student an introduction into the mysteries of the structure of the

central nervous system. It is not intended for the trained anatomist. It fulfils its object, provided the student will read it in connection with a dissection of the human brain and an examination of microscopical serial sections, made by himself, if possible; otherwise he will have very confused ideas of what he has studied. Throughout the work the author uses the Latin terms recommended by the German Anatomical Society in connection with those more commonly employed. The statements are sometimes made with a positiveness that may lead the student to believe that no other views than those set forth in this work are held by reliable anatomists. This fault is difficult to avoid, and yet we think that debatable statements should be presented with an acknowledgment of uncertainty.

The first part of the book is devoted to the gross anatomy; the second to the microscopical anatomy, and in the latter more opportunity for a difference of opinion is afforded. Whitehead speaks of the "spinal tract of the trigeminal nerve." Some German anatomists, while acknowledging that this is a correct designation, occasionally refer to the "ascending root" of the fifth nerve, and the student must add to his burdens the knowledge that this "ascending root" is really descending. Whitehead unfortunately calls the mesencephalic root of the fifth nerve the "descending root." As the spinal root is also descending, we must employ either "cerebral" or "mesencephalic" for the superior root. In several places Whitehead speaks of "olive," but as we have a superior, an inferior and accessory olives, each should be properly designated, especially as this book is for students who are not very familiar with the microscopical anatomy of the nervous system. He also speaks of the olive as showing three pieces. Does this mean that the accessory olives are part of the lower olive? He follows the views of many when he says that the dorsal nucleus of the tenth nerve is sensory. This nucleus has been shown by van Gehuchten to contain cells whose axones pass to the periphery of the medulla oblongata, and this, together with other recent evidence, permits us to regard this dorsal nucleus as motor. Whitehead devotes only a few words to the division of the fibres in the cerebral peduncle, and in this way avoids the disputes that have arisen in regard to the crusta. The region of the hypothalmus, so difficult to understand, receives little attention, and possibly the student will be thankful for this. We may question the statement that the corpus callosum connects corresponding parts of the two cerebral hemispheres, if by this is meant that it connects only corresponding parts, as the words imply. The description of the caudate nucleus as a gourd-shaped mass is excellent, provided the student has in mind the right kind of gourd. Each half of the body is represented in the cortex of the opposite hemisphere, as Whitehead says, but it is also partially represented in the cortex of the same hemisphere. Anatomical findings and clinical phenomena force this view upon us. The upper and anterior part of the parietal lobe should also be included in the motor area. Whitehead believes that the majority of fibres of the median lemniscus terminate in the optic thalmus; he has many to support him in this view.

It is possible to pick out here and there other slight inaccuracies and debatable statements, but this is not an agreeable task, and gives an unfair impression of the value of the book. One is reminded by Whitehead's book of the early editions of Edinger's lectures, and yet

the two works are very differently constructed. Whitehead's little book may be recommended to the student, but he must not imagine after reading it that he understands all the microscopical anatomy of the central nervous system. He will have, however, a fair knowledge of this anatomy, and will be less liable to make the wild guesses too often indulged in by some who attempt cerebral and spinal localization with little knowledge of the relation of the parts. W. G. S.

DISEASES OF WOMEN. A Treatise on the Principles and Practice of Gynecology. For Students and Practitioners. By E. C. DUDLEY, A.M., M.D., Professor of Gynecology, Northwestern University Medical School; Gynecologist to St. Luke's Hospital, Chicago, etc. Second edition, revised and enlarged. With 453 illustrations, of which 47 are in colors and 8 full-page plates in colors and monochrome. Pp. 717. Philadelphia and New York: Lea Brothers & Co.

OUR prediction with regard to the reception which would be accorded to this admirable work has been verified, as shown by the appearance of a second edition in a little over a year. Although the short time which has elapsed since the appearance of the first edition naturally does not permit the introduction of many new facts, the book has been carefully revised, several chapters and illustrations have been added, and considerable new matter has been interpolated. The most striking feature, "the grouping of subjects, not by the more common regional method, but, so far as possible, from the stand-point of pathological and etiological sequence," has certainly commended itself to medical teachers and students.

Although the former edition was exhaustively reviewed in the JOURNAL, it may not be amiss to call attention again to the salient points of this successful work, which represents the mature experience of one of the ablest of the circle of gynecologists who have sat at the feet of Dr. Emmet. In this iconoclastic age it is characteristic of the author that he has never swerved in his loyalty to his old teacher. The criticism has been made that this attempt to reconcile early teaching with facts established by more modern pathology has in some instances led to embarrassment, especially in the chapter on pelvic cellulitis. Again, the objection has been raised that more attention has been paid to the subject of laceration of the cervix than would seem to be justified in view of the diminished importance now attached to this lesion by many gynecologists. Yet, to be consistent, the author could not have taken a different position with regard to these questions, and since he has shown that he is an original thinker, as well as a loyal follower of his honored leader, he should not be harshly criticised. A second reading of the introductory chapters confirms us in our opinion that they are full of practical hints and timely suggestions. The sections on operative technique are not, as is often the case, mere compilations, but represent the experience of a careful and resourceful surgeon.

In reviewing Part II., on infections and inflammations, we are again

struck with the happy way in which the unities are preserved. This is not a new plan, since it has been followed in some foreign works on gynecology, but it has not been so skilfully elaborated in any previous American text-book. Whether the difficult subject of inflammation of the uterus has been made clear to the beginner or not is a question. Personally, we have found that the term "chronic metritis" (or "chronic myometritis," as the writer prefers to call it) is often a serious stumbling-block to the student. We hope some day to see both chronic endometritis and metritis described as end-processes rather than as true inflammatory conditions; indeed, we are sufficiently radical to believe that the expression "chronic inflammation" may eventually disappear from our text-books.

We note that in Part III. tumors, tubal pregnancy and malformations are grouped together, although the connection is not clear. We venture the criticism that the union is an artificial one and that Chapters XXXVI. and XXXVII. would appear to better advantage, the former under the head of inflammation of the tubes (which is practically the etiological factor in tubal gestation), and the latter either at the beginning or at the end of the book.

In Part IV. the author is clearly at home. The description of the various plastic operations on the pelvic floor, cervix and urinary tract show the hand of a master. It is no disparagement to the originator of the operation for repair of the lacerated cervix to say that not even in his own book is the subject so lucidly discussed.

The sequence between traumatisms and displacements is entirely logical. The latter subject is presented most attractively, and will be especially appreciated by the student. The text and illustrations bearing on the author's operation make this ingenious and useful procedure almost as clear as a demonstration on a living subject. We commend pages 632–638 as a good specimen of Dr. Dudley's terse, lucid style. He handles the pen, as he does the scalpel, without any uncertainty as to the end to be attained.

Apropos of the chapter on massage, we question if this method of treatment will ever become popular in this country, or if it should be taught to students. An expert may clearly recognize the contraindications, but no other should attempt the delicate manipulation necessary to free imprisoned adnexa. When, after the lapse of another year, a third edition may, as we trust, be necessary, the author may decide that Part VI. as it now stands does not add to the strength of the book. Indeed, he states in a footnote that it is to be regarded rather as an appendix than as an integral part of the work.

We may have assumed the somewhat ungracious rôle of a critic of the second edition after the unqualified praise which was bestowed upon the first. But the work is so strong in almost all points that we wish it to be made better still, and we feel sure that in subsequent editions certain minor blemishes will disappear and the future critical reader will gladly place *Dudley's Gynecology*, as we do now, side by side with the classical work of his honored teacher. H. C. C.

THE AMERICAN YEAR-BOOK OF MEDICINE AND SURGERY. Being a Yearly Digest of Scientific Progress and Authoritative Opinion in all Branches of Medicine and Surgery, drawn from Journals, Monographs, and Text-Books of the Leading American and Foreign Authors and Investigators. Under the general editorial charge of GEORGE M. GOULD, M.D. Philadelphia: W. B. Saunders, 1900.

THIS year this valuable publication has been rendered more convenient by dividing it into two volumes. There are a few changes in the names of the contributors, but none in the quality of the articles, excepting possibly a slight improvement. In considering this work as it appears from year to year the most striking feature is the small number of really important articles that are contributed annually to medical literature. This is particularly impressive when one realizes the immense number of articles that have been abstracted in order to fill the two volumes. For example, there are considerably over a thousand abstracts in the section on general medicine, very nearly as many in the section on surgery, and altogether we should estimate the total number at approximately five thousand. Nevertheless, it is difficult to select one hundred of these that are likely to be read ten years hence, excepting by those interested in the literature of some special subject. In fact, upon consideration, we think it doubtful if there will be more than ten such—that is, one-fifth of one per cent. It is not to be supposed, however, that because an article becomes worthless in a few years it is necessarily worthless at the present time. If a physician has the good fortune to produce something of lasting value, that is no reason why another who makes a contribution merely to statistics, or simply repeats, to perhaps a different audience, information already more or less well known, has not fulfilled a worthy purpose.

In looking over the book we note in the section on medicine the great number of articles upon typhoid fever. Among the most interesting is one of Stahl's, who describes a curious form of gangrene of the skin that he observed in 10 of 144 cases There is considerable discussion of the possibility of combined infection of malaria and typhoid, and a number of interesting cases are reported by various authors. Practically, nothing is added to the treatment of typhoid fever. In regard to malaria, there is a moderate amount of literature upon the etiological rôle played by the mosquito. This literature has, since the abstracts closed, been considerably increased, and some of it that had, been published in the *Centralblatt für Bakteriologie*, etc., evidently escaped the attention of the contributors. Almost no notice is taken of the vigorous warfare that has been waged regarding the relation of the bacillus icteroides to yellow fever. Tuberculosis, as usual, occupies considerable space; but the only really important article is that by Hauser, who has made a careful statistical and experimental study of the transmissibility of the disease from the parent to the offspring. Considerable work has been done upon the blood, among the interesting articles being one by Löwit upon leukæmia, which he believes is due to an amœba circulating in the blood. Of course, the proof he furnishes is not at present satisfactory. But little that is of remarkable interest has been added to the diseases of the thoracic organs, and the pathology of the stomach has not yet apparently been crystallized into a definite and satisfactory system. Adami believes that cirrhosis of the liver is due to infection by

micro-organisms that ordinarily are killed by healthy tissues. In the section on pediatrics considerable space is devoted to infant feeding, and there is an excellent plate of Koplik's spots on the mucous membranes in measles. One of the most notable articles that is abstracted is that of Birch-Hirschfeld upon the primary seat of tuberculosis in the lungs. Otherwise but little has been added to the subject of pathology in the past year, although Mallory has studied typhoid fever and Streckeisen the fragmentation of heart muscle. The subject of tumors has had barely two and-a-half pages allotted to it. In the section on nervous and mental disease a considerable amount of space is devoted to Collier's article on Babinsky's sign, which has recently attracted wide attention on account of the publications of Walton and others in this country. Some of the articles in this section apparently belong elsewhere, as, for instance, the article of Kuperwasser on the blood in syphilis. The *Archiv für Psychiatrie* appears again to have been neglected. We prefer the term *paralysis agitans* to Parkinson's disease, although in this article the latter is given in preference. Considerable space is devoted to the subject of Finsen's phototherapy in the section on skin diseases; without expressing a positive opinion the editors remark that it is well worthy of further study. In the section on materia medica there is a long discussion upon the results obtained from the antitoxic serums, particularly the antistreptococcic serum. The evidence on this subject is still so contradictory that it is impossible to arrive at any positive conclusion. A good deal of space is also devoted to suprarenal extract, which appears to have proven its value. Necessarily less space has been devoted to the scientific subjects, but we mention with cordial approval the excellent section on physiological chemistry by Jones and Hunt.

The second volume is devoted to surgical conditions and to the specialties more or less akin to them. Improvement appears to have taken place in antiseptic technique, as, for example, by the use of rubber gloves. The study of tumors and cysts, both from an operative and pathological stand-point, is excellent, while the space devoted to diseases of the œsophagus, stomach, peritoneum, and intestines is an evidence of the advances in the surgery of these organs. The literature on X-rays has diminished considerably; on the contrary, the literature of bullet wounds has been somewhat increased as the result of the recent elaborate experiments that have been carried out by various nations in the pursuit of warfare. Kelly's operation of perineorrhaphy is liberally illustrated. The section on anatomy is unusually brief. Wyatt Johnson's article deserves especial praise.

Taking it as a whole, the book fully deserves all the commendation that can be bestowed upon it. It gives a very thorough review of the literature for the period it covers, and is invaluable for the purpose of getting on the track of literature, particularly in reference to obscure cases. J. S.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Aspiration of the Lung in the Diagnosis of Tuberculosis.—The diagnosis of pulmonary tuberculosis before bacilli appear in the sputum is becoming daily more important in practical medicine, since abundant experience shows that the diagnosis can sometimes be made with great certainty before there is sputum, and the X-ray apparatus and tuberculin test are neither always reliable nor always at hand. HENKEL (*Münchener medicinische Wochenschrift*, March 27, 1900) calls attention to the advantage of diagnostic puncture in such cases. The operation is done with strict aseptic precautions. The skin is washed with spirit of soap and ether, shaved, if necessary, the syringe is boiled, the hands are sterilized. Aspiration is made slowly and with short interruptions. The sputum after the operation is occasionally blood-stained, but actual hemorrhages have not been observed. At times there is a slight temporary rise of temperature. The author has never seen any injurious effects, but reserves the operation to the cases in which a positive diagnosis of the existing pulmonary disease cannot otherwise be made. The operation is useful in cases of pneumonia with delayed resolution, and cases of local bronchitis without sputum or without bacilli in the sputum. The puncture should be made where the physical signs are most distinct. Occasional assistance may be derived from the feeling of resistance of the lungs, especially when pleural thickening can be excluded.

Kinds of Gastric Secretion and their Anomalies.—A. SCHIFF (*Archiv für Verdauungskrankheiten*, Bd. vi. p. 107) has made an extensive series of examinations showing the relations of the different gastric secretions to each other in health and disease, and confirming on the whole what previous observers have found regarding the independence of these functions. The

most resistant function is that which produces the diluting fluid. This is frequently present when the secretion of HCl and pepsin are entirely absent, as in many cases of achylia. In animal experiments this secretion can be excited independently of the others, and under the action of pilocarpine it appears earlier and in greater extent than the other secretions. The gastric juice produced by pilocarpine injections is, as a rule, of relatively low acidity, but, as in one of the author's experiments, may contain no free HCl. Next to the water secretion, pepsin is most readily produced. Both pepsin and water are absent only in cases of total atrophy of the mucosa and in many cases of achylia gastrica simplex. In some cases of achylia gastrica pepsin may be absent, though water is still secreted in the stomach. Secretion of pepsin is very constant and easily excited. In the majority of cases of hypochlorhydria and anachlorhydria as long as the mucosa is not destroyed pepsin may be normal, and pilocarpine injections produce a gastric juice at least as strong in pepsin as normal. The secretion of pepsin occurs readily, because the substance is already present in the glandular cells and seems to depend essentially on the energy of the current of gastric juice. The relatively equal amounts of pepsin under the influence of atropine and pilocarpine and in the normal secretion confirms this view. The most difficult function of the gastric glands is that of HCl secretion. The excitation has to bring about not only secretion, but also the production of a substance not preformed, by overcoming chemical affinities. The HCl secretion is the most sensitive function of the gastric glands. It is not only diminished, but often absent in many pathological cases where the pepsin and water are still present, and it can be diminished or checked by lowering the nervous excitability, as by atropine; although here, too, pepsin and water are diminished little or not at all. On the contrary, the increase of HCl secretion cannot be brought about by pilocarpine.

The Recognition and Importance of Bilirubin in the Stools.—SCHORLEMMER (*Münchener medicinische Wochenschrift*, 1900, No. 14) has investigated the bile-coloring matter in the stools, with the result that he entirely rejects Gmelin's test, because it frequently gives a positive reaction when bilirubin is not present. He uses Schmidt's test, carried out as follows: 2 to 3 c.cm. of the fresh fecal matter are rubbed up with concentrated watery sublimate solution. The mixture is allowed to stand in a covered glass dish, and then examined macroscopically and microscopically for green particles. The reaction is reliable, because the oxidation of the bilirubin never goes beyond the stage of biliverdin. The only confusion possible is by vegetable remains containing chlorophyll, which, however, are easy to recognize as such. All substances containing hydrobilirubin are stained red, giving the test another advantage. Examinations with this test led the author to conclusions rather different from some that have been handed down from previous observers, though he confirmed the generally accepted fact that in normal feces bilirubin is always absent. In a number of cases of disease of the stomach with normal stools, bilirubin was always absent, or occurred only in vegetable tissue and microscopic amorphous masses, apparently of soap. In cases of intestinal disease bilirubin was absent in only 4 cases out of 42. In most cases the test was microscopical only, but in 4 cases of acute

enteritis and 2 of colitis, the macroscopic test was positive. The author's results show that in contradiction to previous views bilirubin may appear in the stools in diseases of the colon, as well as in that of the small intestine. Schorlemmer also has examined the particles of so-called yellow mucus supposed by some to indicate inflammation of the small intestine. He believes that these bodies are really albuminous. On the contrary, he finds, as Schmidt did, that small particles of mucus, often containing micro-organisms and granular débris of various kinds, frequently appear in the stools in disease of the small intestine, especially in typhoid fever, though he would only use them for the local diagnosis when there are at the same time numerous fragments of muscle fibre, starch granules, and fermentation.

Diabetic Laryngitis.—The late OTTO LICHTENSTERN (*Münchener medicinische Wochenschrift*, 1900, Nos. 16 and 17) describes this rare complication of the larynx in diabetes. It comes on as an acute circumscribed œdema, rapidly passing on to abscess. The process recurs in different parts of the larynx, especially in the region of the summits and posterior surfaces of the arytenoids, including the mesoarytenoid fold and the hypoglottic region. The abscess usually heals rapidly after it is opened, although the author observed in one case of hypoglottic abscess an abscess on the anterior wall of the larynx. There is no fever, and the general symptoms are mild. The author admits the possibility of the process occasionally becoming more serious, and compares it in this respect with disease of the lungs in diabetes. In regard to the cause, the author looks on overexertion of the vocal organs as a predisposing one. Bacteriological examinations could not be made, but the author admits that bacteria are most probably the exciting cause. He suggests, however, that possibly a toxic product of the diabetes may be the real cause.

The Differences between the Temperature of the Rectum and Axilla, Especially in Appendicitis.—SCHUELE (*Münchener medicinische Wochenschrift*, 1900, No. 18) has made a number of observations showing the relations of the axillary and rectal temperature. He found that this varies between 0.1° and 1.5° C. In two cases there was no difference. Some of the persons examined seemed inclined to slight differences; others to relatively great ones. The cause of the greater differences seem to be due to a relatively low temperature of the axilla. In afebrile persons the axillary temperature never exceeded 37.2°. The average of 162 measurements on 16 afebrile persons was 0.6° C. The difference in fever was usually less, *i. e.*, 0.4° C. In one case of appendicitis with abscess into the bowel, the difference varied from 1.1° to 1.4° during the development of the abscess. The author looks on this as perhaps of diagnostic value in suspected inflammation in the pelvis. This idea had previously been entertained by Lenander and Madelung, though Lenander found many cases of beginning abscess-formation with relatively small differences.

Acute Infectious Poliomyelitis Anterior in the Adult.—GUMPERTZ (*Berliner klinische Wochenschrift*, 1900, No. 16) adds to the small number of cases of this kind the following: A robust merchant, of twenty-three years,

was taken sick for a few days with nausea, loss of appetite, lassitude, and fever. Four days after resuming work he became paralyzed. Examined soon after he was found free from cerebral symptoms, the left arm was paralyzed, the left leg was paretic, the muscles of the thigh relaxed, those of the leg slightly contracted. In the left buttock, near the spinal column, was a large furuncle. The knee-jerk was absent on the left side; normal on the right. The left deltoid muscle did not respond to the faradic current, sensibility was not impaired. The patient was treated with galvanization of the cord and galvano-massage of the paralyzed muscles. The paralysis gradually improved so that the patient could climb stairs, but easily became fatigued. There was atrophy and reaction of degeneration of the left deltoid muscle, but the biceps reacted almost normally. The absence of sensory disturbance, of pain, or increased galvanic irritability, and the fact that the paralysis was most marked in the beginning, excludes multiple neuritis. The sudden appearance of the symptoms and their extent excludes hemorrhage, so that acute anterior poliomyelitis of the rare hemiplegic form seems the only explanation. The author looks on the cause as an infection, probably typhoid. His suggestion that bacilli passed from the furuncle to the corresponding side of the cord is very plausible, but inasmuch as he also states that another abscess occurred on the opposite side, and as no observations were made of the bacteria in the abscess, some other explanation of the unusual localization of the disease must be admitted as possible.

A Study of Twenty four Cases of Typhoid Fever with Symptoms of Peritoneal Infection; Laparotomy.—GEO. B. SHATTUCK, J. COLLINS WARREN, and FARRAR (*Boston Medical and Surgical Journal*, June 28, 1900, p. 677) have published a most interesting report on twenty-four cases of typhoid fever in which there were symptoms of peritoneal infection, for which exploratory laparotomies were performed. They report in all on twenty-seven cases, but in three the proof of a typhoid infection was not sufficiently strong to include them. These cases were under treatment in four of the Boston hospitals since 1895.

Out of the twenty-four cases of true typhoid, only seventeen were cases of peritoneal infection from actual perforation of the intestinal wall. In two cases there was a general infection from threatened perforations or areas of necrotic peritoneum; in one case a general infection from a ruptured mesenteric gland; in one case a general infection from an unknown cause, presumably intestinal perforation; in three cases there was no certain cause for the symptoms which demanded operative interference. In other words, there were twenty one cases of grave peritoneal infection in typhoid fever and three cases of mistaken diagnosis, but with symptoms of peritoneal infection.

Eighteen of the twenty-four cases were males and six were females. In eighteen of the twenty-four cases the clinical nature and course of the typhoid were mild, and in fifteen of these eighteen mild cases perforation or general septic peritonitis was present. These data show, as has been generally held, that there is no relation between the severity of the course of the fever and the likelihood of intestinal perforation.

In five cases the acute abdominal symptoms appeared at the end of the second or first of the third week, in eight cases at the end of the third week,

in one case during the fourth week, in four cases during the fifth week, in one case during the ninth week, in one case during the eleventh week in a relapse.

Seven cases of the twenty-one in which operation found cause for the symptoms presented a sudden acute picture of grave abdominal infection without any premonitory symptoms. In fourteen there was a more or less gradual onset of the abdominal symptoms, or at least distinct warning symptoms which antedated the equally distinct severe and diagnostic symptoms.

In the seven cases with no warning symptoms operation was done within twelve hours in every case. In the fourteen cases in which there were warning symptoms the average time of the operation, after the onset of the early warning symptoms, was twenty-three hours.

Of the twenty-one cases in which the local or general peritoneal infection was found at operation, three cases recovered—that is, 14.3 per cent. Taking their twenty-four cases of typhoid fever which were operated on, twenty-one with abdominal infection and three with no infection found at operation, they had six cases of recovery from laparotomy in typhoid fever, or 25 per cent.

Concerning the question of diagnosis, the fact that these writers had diagnosed general peritonitis in three cases without any peritonitis being found at operation is further proof of the great difficulty of making a diagnosis of peritonitis in some cases.

With regard to the study of the leucocytes in their cases, they say that they are not able to establish anything new and valuable in regard to leucocytes as a symptom, owing to lack of sufficient data. Their one conclusion is that the leucocyte counts in typhoid cases should be sufficiently frequent to be of comparative value; that any complaint of abdominal pain or the appearance of abdominal symptoms demand frequent counts.

From an analysis of their series of cases the writers conclude that:

(1) In many very sick typhoids perforation or peritoneal infection cannot be diagnosed until the results are already wide-spread and of fatal extent. The chances of a fatal issue from an abdominal operation in such cases are overwhelming.

(2) In mild typhoids of fair general condition an abdominal operation is readily borne, provided no peritoneal infection is present.

(3) A small number of mild typhoids may have sudden perforation with free extravasation. In these the symptoms are fulminant, but localized to a great extent, and in these

(4) Operation must be done at once, for general infection may become past relief in from one to five hours, and walling off of the perforation by protecting adhesions is so rare as not to be counted upon.

(5) In the majority of mild cases, beginning infection (whether from perforation or not) is marked by comparatively slight symptoms—local pain, tenderness, spasm, and leucocytosis. The severe subsequent symptoms were due to general peritonitis.

(6) These warning symptoms demand serious consideration and study, but in many cases are either not rightly understood or not acted upon.

(7) Complaint of abdominal pain in a case of typhoid should always lead to a suspicion of beginning peritoneal infection.

(8) Frequent leucocyte counts are needed in every case of typhoid. In the presence of abdominal pain an hourly count is necessary.

(9) Pain associated with local tenderness and muscular spasm and a rising white blood count points in most cases to the advisability of an operation; in all cases to the necessity for a surgical consultation.

(10) In not a few of this series of cases operation was imperative a varying number of hours before it was done.

If it can be appreciated that the severe symptoms more often mean general peritonitis, it must be understood that the milder and earlier symptoms are the important ones.

Typhoid Fever in an Infant Nine Months Old; Recovery.—During the past five years there has been considerable controversy among physicians especially interested in diseases of children regarding the frequency of typhoid fever in infants under two years of age. NORTHRUP (*Presbyterian Hospital Reports*, New York, 1900, vol. iv. p. 74) held that the disease was rare in infants. He advanced the thesis that "typhoid fever is a disease to which there is little susceptibility in children under two years of age. In epidemics children under two years of age, though naturally little susceptible, may, in the presence of an overwhelming poison (multiplied exposures), acquire typhoid fever." This view was strongly assailed by nearly all the Pediatric Society, but was supported by Rotch and Holt. Lovet Morse, of Boston, is also led to support this view as a result of his experience with the Widal test in continued fevers of doubtful origin in infants coming to the dispensary in Boston.

In the extensive epidemic of typhoid fever in Stamford, Conn, there were four cases under two years of age, one of which terminated fatally.

Northrup himself reports an undoubted case in a female infant of nine months. The child had been breast-fed, but there were five other members of the family down with typhoid fever, and she had been crawling about the bed of her father, ill in his second week, and that of a brother who had been ill for seven weeks.

The diagnosis in this case was made on the continued fever, enlarged, palpable spleen, rose-spots, and two positive Widal tests.

Northrup personally has seen six cases of undoubted typhoid fever in patients of two years and under, viz.: nine, thirteen, sixteen, twenty-two, and twenty-four months of age, and draws the following conclusions:

(1) The diagnosis in all these cases was easily made on signs and symptoms characteristic of typhoid in adults.

(2) The cases were all intimately associated with others in the family.

(3) Skepticism should be encouraged concerning any diagnosis of typhoid fever in an infant (under two years of age) not intimately associated with other cases.

(4) The most common mistakes arise from misnaming as typhoid the following diseases: Grippe, subacute catarrhal enteritis, central pneumonia, and malaria.

A Rapid Method of Fixing Blood-films for Ehrlich's Stain.—SOLLEY (*Presbyterian Hospital Reports*, New York, 1900, vol. iv. p. 169) has endeavored

to find some suitable rapid method of fixing dried blood films to take the place of the slower method of fixing by heat. Various agents were tried without success, the main difficulty being in getting something to fix both the red and white cells equally well.

G. A. Tuttle experimented with solutions of chromic acid of various strengths. He eventually found that a 2 per cent. solution of chromic acid poured on the film and allowed to remain for exactly thirty seconds gave uniformly good results, both red and white cells taking up their special stains clearly and surely. Solley states that the nuclei and granules of the leucocytes stain quite as sharply as in the best specimens fixed by heat, while the protoplasm of the mononuclear lymphocytes is usually better stained than by the latter method.

After the chromic acid solution has been on the smear for thirty seconds it is thoroughly washed off, the excess of water being removed by tapping a corner of the square on filter paper. Ehrlich's triple stain is allowed to remain on the smear for three minutes. The stain is then washed off, the smear dried between filter-paper, and then mounted in balsam in the usual way.

Unfortunately, the article does not state whether the chromic acid is dissolved in water or alcohol, but it is inferred that the former is used.

SURGERY.

UNDER THE CHARGE OF

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Median Osteotomy of the Hyoid Bone as a Method of Performing Pharyngotomy.—VALLS (*Rev. de Chir.*, May 10, 1900) proposes this new operation in order to overcome some of the dangers and difficulties that surround the removal of malignant or benign growths from the pharynx or the base of the tongue, and that are met with in the complete removal of the tongue.

The method of operating is as follows: An incision in the median line is carried from the mental symphysis to the thyroid cartilage. The skin and subcutaneous tissue can be incised at one cut. The bleeding is insignificant. The next step is the denudation of the hyoid bone in the median line. The superficial cervical aponeurosis is incised, the myohyoid muscle is raised in the median line by using the grooved director, so that its upper border can

be severed from the hyoid bone in the median line. Here an arteriole or two may be met. The hyoid bone is then resected in the median line with the bone forceps. The two parts of the myohyoid can then be gradually separated with it, thus providing an opening about an inch and a half wide.

Two ways are open to the surgeon: Below is the thyrohyoid membrane, above the mucous membrane alone separates him from the pharynx. The closure of this wound is very simple after the operation has been completed. It is not necessary to attempt an osseous suture. The result is functionally as good if the muscle and fibrous tissues are sutured. The result in fibrous union is just as efficient from the functional stand-point.

A preliminary tracheotomy has not been found essential to successful operating when this incision is employed, except where the operation involves the larynx directly.

The superior route is to be employed in total removal of the tongue or removal of tumors from its base, while the other route is the best for attacking tumors of the pharynx, especially of the epiglottis, and foreign bodies.

The author formulates the following conclusions:

1. The median osteotomy of the hyoid bone is a simple, easy operation and essentially benign.

2. It permits the penetration into the pharynx and gives a better view and operative field than does Malgaigne's superhyoid operation. Foreign bodies, enucleable benign tumors, cancers limited to the epiglottis, and especially grave syphilitic lesions, are its indications.

3. It facilitates the removal of intramuscular tumors at the base of the tongue, lipomas, and hyoid cysts which are difficult to remove by the lateral route.

4. It facilitates the total amputation of the tongue in cases where the cancer is situated in the base. The amputation is complete, and is less dangerous by this method.

5. There are no remote sequelæ from the osteotomy. It leaves no deformity behind it or functional disability.

Two Cases of Œsophageal Diverticulum.—Richardson (*Annals of Surgery*, May, 1900) reports the case of a gentleman, aged fifty-three years, who came to him in consultation, having had symptoms of an œsophageal diverticulum for some years. Although it had caused symptoms its presence was not discovered till a year after they commenced. An œsophageal bougie of considerable size can be passed without difficulty.

The diverticulum was found on the left side of the neck, with its orifice at about the level of the cricoid cartilage. It fills with the first food swallowed at a meal, but the distended pouch does not further interfere with deglutition. The pouch can be partly emptied by a voluntary muscular effort soon after eating. It can then be swabbed clean by the patient with a cotton-tipped bougie. In the past three years the diverticulum has increased in depth about one-half, and perhaps doubled its capacity. It held about one ounce at the first examination made by the author. The author at this time gave the opinion that the diverticulum, although not causing the patient serious inconvenience at the time, ought, in the near future, to be operated upon because of the tendency of these lesions to get worse. The operation

advised was external œsophagotomy with closure of the œsophageal wound immediately, and packing of the external wound for a day or two.

The patient was seen for the second time about five years later. There had been some increase in the dysphagia, and choking at table had been more troublesome. His general health had not suffered much. The probang could be passed into the pouch, but not by it. No tumor could be felt, whether the pouch was empty or not. The age of the patient and the increasing dysphagia led the author to operative intervention, as delay, with increasing years, would render the operation more dangerous. The danger of the formation of phlegmons and the setting up of a general sepsis was also considered.

The operation was performed under ether. The excessive flow of mucus was controlled by a hypodermatic of atropia, which was found very successful. The lateral incision along the anterior edge of the sternocleidomastoid was made. To get a clear view of the field the anterior belly of the omohyoid was cut. Especial care was taken to avoid the recurrent laryngeal nerve and thoracic duct. The great vessels of the neck were at the lower angle of the wound, which was dry without the use of a single ligature. The pouch was not readily found, but was discovered by the blunt dissector between the œsophagus and the vertebræ. It extended down behind the œsophagus nearly to the arch of the aorta. The sack was loosely attached and readily drawn out after blunt dissection. The œsophageal opening was difficult to find and was discovered by passing a probang. The fundus of the pouch was opened, its extent determined, the neck resected and united by an interrupted suture in the mucous lining and a Lembert suture in the body of the external layer.

The external wound was closed except a small opening where a gauze drain led down to the line of suture. The suture-material of the internal or mucous suture was fine catgut, the others silk. The patient recovered rapidly The greatest discomfort was from the expectoration of mucus, the greatest pain from swallowing. The difficulty in swallowing gradually disappeared. The packing was removed on the fourth day. The stitches were out on the seventh. The wound was entirely healed on the tenth day. No difficulty has been experienced in swallowing since.

The second case presented symptoms that were not as marked, but the diagnosis seemed reasonably certain. Gastrostomy was considered, but deemed inadvisable, and operation on the stricture and removal of the diverticulum was decided upon. The operation disclosed a condition similar to the first case, but with the addition of a stricture cicatricial in character lined with a mucous membrane that was friable. In examining the œsophageal stricture the mucous membrane was torn, and it was decided to divide the stricture and increase the calibre of the œsophagus by utilizing the pouch as a portion of its wall. The operation was successful, and at no time since has there been any obstruction of the œsophagus or difficulty in the passage of food. The suture was not, however, sufficiently close, and leakage was expected, so gauze wicks were left down to the line of suture. The patient recovered with a fistula, which, however, decreased in size so that very little fluid and no solid food escaped.

The Surgical Treatment of Dilatation of the Stomach.—BIDWELL (*Lancet*, April 7, 1900) makes the following classes as the principal causes of

dilatation of the stomach: (1), cicatricial contraction of the pylorus, due usually to old gastric ulcer; (2), malignant disease of the pylorus; (3), adhesions outside the pylorus; (4), gastroptosis; (5) spasms of the pylorus from ulcer or from excess of free hydrochloric acid; (6), atony (?); (7), various neuroses; and (8), floating kidney on the right side.

In reference to the various methods of examination he points out that on inspection of a case of pyloric stenosis one often sees not only a rounded tumor caused by the dilated stomach, but waves of peristalsis passing across the abdomen from left to right. By auscultation we may hear splashing sounds within the stomach, and bubbling of gas in the region of the pylorus. Intubation is a most valuable method, and its use should never be omitted in the examination of a case of dilated stomach, except where active ulceration is strongly suspected. A soft rubber tube is swallowed by the patient with practically no discomfort, and the stomach contents can then be evacuated by expression on the stomach or by the attachment of a siphon-tube. It is usual, an hour before using the tube, to give Ewald's test breakfast, which consists of a plain roll and half a pint of warm water or weak tea; the fluid obtained after extraction is available for the application of chemical tests. To cause artificial distention of the stomach the two constituent parts of a Seidlitz powder may be given separately in a little water. The carbonic acid gas thus generated causes dilatation of the stomach, and enables one to define its limits with precision. This method, however, causes considerable discomfort to the patient, since carbonic acid gas causes spasms of the pylorus; less discomfort is experienced if the stomach be distended by air pumped in by means of the stomach-tube. The chemical examination of the stomach contents is undertaken to determine whether there is an excess or absence of free hydrochloric acid and whether lactic acid and acid lactates are present. The simplest test for hydrochloric acid is a solution of phloroglucin and vanillin in absolute alcohol. A few drops are placed on a china plate and a drop of the stomach filtrate is placed close to it, so that the edges of the two drops coalesce. The plate is then warmed, and if any free hydrochloric acid is present a red tinge appears; the amount can be estimated by making a control test with a 0.1 per cent. solution of the acid. The easiest test for lactic acid or acid lactates is to place a few drops of neutral ferric chloride solution in three drachms of 1 to 20 carbolic acid solution, and then add water until an amethyst blue color results; a few drops of the stomach filtrate added to this will produce a yellow coloration if lactic acid or acid lactates be present.

These tests are of importance in distinguishing between the various forms of dilated stomach; thus in malignant disease we usually get a large amount of lactic acid and an entire absence of hydrochloric; in gastric ulcer or cicatricial contracture due to this we find an excess of free hydrochloric acid, and in dilatation due to gastroptosis or to neuroses we often find the amount of free hydrochloric acid fairly normal. These are not, however, absolute rules, and have their exceptions. The presence of a tumor is not a guide in malignant cases; if the tumor can be felt the disease is probably too far advanced for radical relief. A distinct nodule can, however, be felt sometimes in cicatricial stenoses, and a small movable tumor has been felt in two instances by the author. These are not all the symptoms, but these are of special im-

portance. Coffee ground vomit is symptomatic of malignant disease that is well advanced; it may be absent in early stages and its clinical significance is slight.

The symptoms of malignant disease of the pylorus that indicate operation are: (1), pain, usually localized to the pyloric region, and felt in the back; (2), signs of dilatation of the stomach; (3), retching and vomiting, usually only after solids; (4), peristaltic waves seen over the stomach area; (5), absence of free hydrochloric acid from fluids obtained on passage of the stomach-tube or from vomited matter; (6), progressive emaciation; (7), obstinate constipation; and (8), progressive anæmia. The age of forty is usually the dividing line between malignant and ulcerative stenosis.

The author then discusses the various methods of operating, and concludes as follows: This series of cases shows (16 cases) that operations for non-malignant stenosis of the stomach are very successful, the mortality is *nil*, and unless the case be left too late and the patient become exhausted with frequent vomiting, etc., there is no reason why the operation of pyloroplasty should not be absolutely successful. The most desirable operation in non-malignant stricture is pyloroplasty, since the opening in gastro-enterostomy seems to have a great tendency to contract. The same remark applies to Loretto's operation. The mortality of pyloroplasty is stated to be 11 per cent, but the author is inclined to think this too high in non-malignant cases. In malignant cases there is absolutely no question that the fatal issue in nearly all cases was due to the delay in seeking operative relief, and he is inclined to think that an operation undertaken in the early stages of malignant stricture will not be followed by a much higher mortality than a similar procedure in cicatricial stenosis. The important point, then, is to make an early diagnosis. Unfortunately, this is very difficult, and so an exploratory operation is to be recommended in doubtful cases. With regard to the nature of the operation, in cases where no tumor can be felt by palpation, and only a small one is found on opening the abdomen, pylorectomy should be performed. The risk is lessened by performing it in two stages, viz.: first, do a gastro-enterostomy, and then when the patient has been fed by the mouth for fourteen days, to build up the strength, the pylorectomy should follow. In advanced malignant disease gastro-enterostomy affords considerable temporary relief. He feeds his patients on the day following the operation by the mouth, and increases gradually without bad results.

A Case of Suppression of the Urine of Sixty Hours' Duration Treated by Operation.—JAFFREY (*The Lancet*, March 3, 1900) reports the case of a man, aged fifty-three years, who was brought to him after a suppression of urine had existed for sixty hours. He had suffered a dragging pain in the region of the left kidney a month previously. Micturition was frequent; his urine appeared natural in color, and he had never seen any blood. No definite tumor could be felt until the third day after the suppression commenced, then an apparently hydronephrotic kidney was detected. He had never had any trouble with his urinary tract.

When first seen his expression was anxious and he was restless. There was marked perspiration, especially of the hands, and the tongue was fairly moist. The pulse was rapid (124) and intermittent, dropping a beat about

every seventh beat, and the respirations were 24. He complained of considerable pain and tenderness over the region of the left kidney. A large tumor in the lumbar region could be palpated, but was very tender.

The operation disclosed, instead of a hydronephrosis, a mass of blood-clots, more than a pint, between the perinephritic fat and the kidney, and on incising the capsule blood was found between the capsule and the cortex. The kidney was enlarged and congested, and its pelvis was filled with blood-clots. No calculus was felt. A sound detected none in the upper part of the ureter.

Two hours after the operation was completed and a drainage-tube introduced the dressings had to be changed, as they were soaked with urine. The tube slipped out during the night, and was not replaced. Thirty-six hours later practically all urine was passed by the urethra. The first urine passed contained blood, but not in any quantity; it gradually decreased and disappeared.

The author recalls a similar case, which was too near death for operation, in which an analogous condition was found in the kidney. A small, scale-like calculus was found obstructing the ureter. It would have been readily displaced by manipulation. The author believes that such may have been the cause in this case.

In reference to operation he holds that in these cases, if one is certain of the diagnosis, the sooner the kidney is explored the better. There is difficulty in many cases in ascertaining which kidney is affected. Laparotomy and the examination of both kidneys have been recommended, followed by lumbar incision and the removal of the stone, but there are many cases recorded which have been operated upon and in which no stone has been found.

The Technique of Lumbar Puncture.—CONNER (*New York Medical Journal*, May 12, 1900), in discussing the choice of location at which the puncture shall be made, says there are three chief requirements to be considered:

1. That the needle shall find ready entrance to the subarachnoid space.
2. That the tapping be made at a point least likely to admit of damage to the nervous structures of the canal.
3. That the fluid obtained shall be as rich as possible in sediment.

In reference to the selection of the point of puncture he says that with free access through three lower spaces he sees no reason for selecting the second space. The floating nerve-roots of the cauda equina move about so readily that they are not likely to be damaged, even if touched by the point of the needle.

The last requirement, that of obtaining fluid richest in sediment, is best fulfilled by tapping in the lumbosacral space. Puncture in the upright position should in general be confined to children. Whatever the position, as much ventral flexion of the spine should be secured as possible.

General anæsthesia in most cases is unnecessary. By anæsthetizing the skin with cocaine or a freezing spray the needle can usually be introduced with very little discomfort.

The determination of the landmarks can be readily made by counting from the twelfth dorsal to the first spinous tubercle of the sacrum. When the patient is very fat or muscular the point can usually be determined by a

line between the highest points of the iliac crests. When the spine is flexed this line usually passes near the upper edge of the fourth spine. Occasionally it will cross the space between the third and fourth spines.

"An antitoxin needle 4 or 5 cm. long and 1 mm. in diameter serves admirably in children. For adults the needle should be 8 or 9 cm. long and of a diameter sufficient to give the rigidity needed to penetrate the tough ligament readily.

"An approximately accurate idea of the pressure can be obtained by using a bent glass tube of small calibre. The short, horizontal limb is attached by a bit of rubber tube to the needle, while the long perpendicular limb will record the height of the column of fluid.

"After the desired space is located the interval between the spines is marked with the finger of the left hand, and the needle is introduced at a point opposite the upper edge of the lower spinous process and in a line just outside. The needle is directed very slightly upward and toward the median line, with a view to having it in the median line when it enters the subarachnoid space. In children the puncture can, as Quincke says, be made directly in the median line; but even in children the supraspinous and intraspinous ligaments often offer considerable resistance, and it is usually wiser to avoid these by going slightly to one side. As the needle passes through the interlaminar ligament the resistance is increased, and a slight, grating feeling is noticed; beyond this the needle slips in very easily, and is introduced until fluid begins to appear in the syringe.

"In children the fluid is reached at a depth of from 2 to 3 cm.; in adults, at from 4 to 7 cm. If bony resistance is met in introducing the needle, the latter is to be withdrawn for a slight distance and directed at a slightly different angle. After the fluid appears the syringe is taken off and the fluid is collected in the sterile tube. In the horizontal position it flows drop by drop. In the upright position it frequently runs in a gentle stream. It is much better to let the fluid run from the needle than to aspirate with the syringe. The sudden reduction of pressure by aspiration may easily produce unpleasant symptoms. Occasionally, when the flow through the needle is unsatisfactory, it may, however, be necessary to apply gentle suction with the syringe.

"The amount of fluid to be removed will depend upon the purpose of the puncture. If for diagnosis alone, 10 or 15 c.cm. are usually ample; if for therapeutic purposes, it may be desirable to remove several times that amount. Perhaps the safest guide is the condition of the patient. Headache, faintness, or a change in the character of the pulse are indications to stop."

The Treatment of Some Forms of Appendicitis at Plombieres without Operation.—KEITH (*The Lancet*, March 3, 1900) describes two cases which were distinctly benefited and one cured by the treatment at the baths of Plombiéres. The treatment consisted in forty- to fifty-minute baths at a temperature of not less than 34° C. and not more than 36° C. After the first few baths and for the last ten minutes of each succeeding one the Tivoli douche was used. "This is simply a spray of warm water coming out of a rose somewhere about an inch in diameter. It is allowed to play

against the affected part like a feather." This is a most important point. If it be used too strong it seems to do harm, as there is almost certain to be an attack of pain where the douche is improperly used in this way. After the baths the patient had to lie down in bed for half an hour.

Of course, this treatment is not adapted to all cases, nor can it cure a condition that can be relieved by surgical measures alone. This author's experience has shown him that the treatment at Plombiéres is very successful in cases of chronic diarrhœa, in constipation (though at first sight this may seem peculiar), in mucous colitis, and in appendicitis. The baths—and the treatment is practically limited to baths, though some people drink a small quantity of water before lunch and dinner—are recommended for various other conditions, especially for rheumatism.

PEDIATRICS.

UNDER THE CHARGE OF

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A Case of Pneumothorax Complicating Whooping-Cough.—FRANCIS VILLY (*The Medical Chronicle*, May, 1900, p. 99) reports a case of this rare complication of pertussis. The patient was a boy, aged three years, who was admitted to the hospital suffering from a severe attack of faucial diphtheria complicating whooping-cough, and convalescing from measles which had begun nine days before, and was accompanied by otitis media. The faucial condition cleared up rapidly, but meanwhile the attacks of coughing, which were slight and infrequent at first, became very numerous and severe. From the beginning the pulse rate had been rapid, as is often observed in those who suffer from diphtheria and whooping-cough together. The rate of respiration was also increased, but no abnormal physical signs were to be found in the lungs, nor in the heart beyond a shortening of the first sound. Definite abnormal physical signs were found in the lungs for the first time three weeks after admission to the hospital, in the form of râles heard all over both lungs, but especially at the bases; several small areas of rather doubtfully impaired resonance were noted. When first seen by the reporter, a week later, the child was exceedingly ill. The pulse was rapid, regular and full, but of very low tension, 145 to the minute. Paroxysms were frequent and very severe, and in the interval respiration was shallow and rapid, averaging 80 to the minute. Several small patches of bronchopneumonia were noted at the bases posteriorly. By the next day râles had become very marked at the left base, while just below and internal to the angle of the scapula the breath-sounds were distant, and the expiratory murmur was pro-

longed and almost bronchial in type, but no dulness was observable. On the following day slight hyper-resonance was detected over the left base. The needle of an exploring syringe was inserted below the angle of the left scapula and gave issue to gas, which readily filled the syringe. Two days later aspiration was made under chloroform, with the idea of evacuating the gas and pus, if the latter were present, since the temperature had remained slightly and irregularly elevated since admission to the hospital. A considerable quantity of gas was evacuated, but no pus accompanied it. On the following day the differences in the physical signs at the two bases had disappeared, and steady improvement in the child's condition continued, the whooping-cough progressing slowly to ultimate recovery.

The Treatment of Whooping-Cough with Antitussin.—MAXHEIM (*Berliner klinische Wochenschrift*, December, 1899) reports his experience in the treatment of pertussis with this recently introduced remedy. Antitussin is a preparation containing five parts of difluor-diphenyl, ten parts of vaseline, and eighty-five parts of lanolin. It is used by inunction, a portion of the ointment as large as a walnut being rubbed into the skin three or four times a day. The writer reports sixteen cases in which this preparation was used with most gratifying results, nine of the cases being in the convulsive stage when treatment was begun. His conclusions are that antitussin has a marked anti-convulsive action in every case, and that the characteristic attacks are much lessened in severity, and the convulsive stage soon changes to the catarrhal; that it has a marked expectorant action, so that the tenacious mucus is easily expectorated; that when treated with antitussin at the onset, or shortly after, the disease will not pass beyond the catarrhal stage; that there is no toxic effect. The drug has been used in catarrhal diseases of the larynx and bronchi and has shown a marked expectorant action.

Panaris Due to the Diphtheria Bacillus.—SEITZ (*Correspondenz-Blatt f. schweiz. Aerzt.*, 1899, No. 21) relates a curious observation under this title. He had occasion to treat a boy, aged sixteen years, for a small superficial panaris of the right middle finger, which healed rapidly after opening. Bacteriological examination of the pus showed the presence of streptococci, staphylococci, and an organism which at first was taken for a pseudo-diphtheria baccillus, but which was recognized, after inoculation experiments, as a true diphtheria bacillus sufficiently virulent to kill guinea-pigs in from two to three days. When this fact was established a culture was made from the throat of the patient, five weeks after the opening of the abscess on the finger, and virulent Klebs-Löffler bacilli were found. The boy stated that he was in the habit of biting his finger nails.

At the same time other members of the patient's family were examined; the throats of the father, the mother and a sister were free from the organism. But it appeared that a brother separated from the family for three months, and never having been in contact with the patient during this period, had had diphtheria about one month after the patient's panaris developed. The patient had therefore carried virulent bacilli in his throat without having diphtheritic angina and without infecting other members of his family.

Several other instances of diphtheritic panaris are related by HAU (*Lyon*

Médical, 1900, No. 4), one in his own person as the result of infection during an autopsy upon a child dead of diphtherial croup. Two other cases were observed in the same hospital about this time among the nurses, the location in both instances being on the palmar surface of the ungual phalanx of the thumb. All three cases were characterized by the absence of false membrane and by the presence of a sero-purulent liquid rich in bacilli. The acute stage was short and the general reaction slight. Constitutional treatment was not employed. Disappearance of the bacilli was not obtained until the surface of the lesion was exposed to light and air.

Treatment of Thrush.—ESCHERICH (*Semaine Médical*, 1900, in *Revue Mensuelle des Maladies de l'Enfance*, June, 1900, p. 304) makes use of an ingenious device for the treatment of mycotic stomatitis. He directs that a small tampon of sterile cotton be impregnated with about 20 centigrammes of boric acid finely pulverized and mixed with a small quantity of saccharine. The cotton is then enclosed in a little sac of silk or batiste carefully sterilized, and this is given to the infant to suck. Ordinarily the child will continue to suck it on account of the sweet taste imparted by the saccharine. The boric acid is thus slowly dissolved by the saliva and acts directly and continuously upon the oïdium albicans. A fresh sac is to be used on the following day.

The effect of this treatment is said to be rapidly manifest. In recent cases, when the deposit is not very extensive, it disappears entirely within twenty-four hours, except in the gingivo-buccal sulcus, from which it is removed during the next twenty-four hours. In the inveterate cases cure requires a somewhat longer time, but may be hastened by mechanical cleansing and lavage of the mouth with appropriate washes.

This method of treatment is not of value in moribund cases in which the power of sucking is lost and the saliva is not secreted.

The Treatment of the Laryngitis of Measles.—SEVESTRE (*Société de Pédiatrie*, Séance, April 9, 1900) prefers intubation to tracheotomy when operative interference is necessary. In 1898 and 1899 he operated upon 40 cases of laryngitis of measles complicated by diphtheria. Intubation gave 20 recoveries out of 34 cases, while all of three cases submitted to tracheotomy died, and of 3 cases subjected to tracheotomy after intubation all recovered.

In the uncomplicated laryngitis of measles the results are bad for all forms of intervention. In 10 intubations Sevestre had 8 deaths, in 2 tracheotomies 2 deaths, and in 2 intubations followed by tracheotomy 1 death.

Ulceration of the mucosa, which is the chief disadvantage of intubation, can be avoided, in a certain measure, by not leaving the tube long in place and by employing tubes of small calibre. Intubation has the advantage over tracheotomy of exposing less to secondary infection. Expectant treatment should be faithfully tried before deciding upon surgical intervention.

Chronic Vomiting Due to Rhinopharyngitis and Adenoid Vegetations.—BRETON (*Revue Mensuelle des Maladies de l'Enfance*, May, 1900, p. 235) reports the case of a child, of five years of age, in whom almost uncon-

trollable vomiting appeared to be directly due to nasopharyngitis and adenoids. Vomiting had begun about a year before observation, at first occasionally, but finally it had occurred after almost every meal. Shortly after food was taken into the stomach it would be rejected more or less completely. As a result of this continued loss of nourishment, serious impairment of health followed.

Examination of the digestive organs revealed a dilatation of the stomach and cæcum, and of the transverse colon. The stools contained mucus, were hard and required solicitation, being passed with considerable discomfort.

The tonsils were somewhat enlarged and adenoid vegetations were studded over the wall of the pharynx, and extended into the nasopharynx, while the nose was the seat of a double rhinitis.

After removal of the adenoids and treatment of the nose the vomiting ceased completely and the general condition of health at once improved. A return of vomiting was found to coincide with a relapse of the nasopharyngitis, and after this was successfully treated the vomiting again ceased.

Scarification versus Denudation by Caustic Potash as a Means of Preparing the Skin for Vaccination.—FIELDER (*Medical Record*, vol. lvii., No. 4) criticises the efficacy of the method of preparing the skin for vaccination which was proposed by Hutchin. This is accomplished by denuding an area of the skin by means of liquor potassæ or the stick of caustic potash. After a series of experiments in which primary vaccinations were made both by scarification and by denudation, he concludes that scarification is the more satisfactory method. Denudation by caustic potash is less painful to the child and does not draw blood, but it takes a longer time, requires more skill, presents difficulties in getting the denuded surface small enough, so as to prevent the formation of too large a vesicle, and it is less certain than scarification, because of the formation of an eschar which interferes with absorption.

Fœtal Rickets.—FEDE and CACACE (*Pediatria*, February, 1900) discuss in considerable detail the literature upon this much-disputed question, which dates from the description of the condition given by Glisson in the seventeenth century. Since then numerous cases have been recorded as examples of fœtal rickets. Certain observers, like Rednar, Kassowitz, Schwarz, Cohn, Quisling and Lentz, have maintained that such a condition as fœtal rickets is of frequent occurrence, while another group claim that it is quite rare, or even does not exist, the cases so described being in reality non-rhachitic in nature.

The writers have therefore undertaken a systematic study of the external characteristics of new-born infants, with careful histological study of the bones of normal and of so-called fœtal rhachitic cases.

This study embraced 500 new-born infants observed in the maternity of the Hospital for Incurables in Naples. In each case measurements of the length of the body, of the circumference of the head and thorax, of the fronto-occipital arc, and of the biparietal arc were recorded.

Of the 500 infants studied, 474 were born at term, 22 at 8 months, 4 at 7 months. Of the full-term infants 248 were males and 226 females; of the

22 born at 8 months, 12 were boys and 10 girls, while of the 4 born at 7 months 2 were boys and 2 girls.

Craniotabes was present in 3 cases out of the 474 born at term, and in 1 of the 22 born at the end of the eighth month of gestation. Only one case in the 500 could be said to have the clinical signs of rhachitis. The authors therefore conclude that since only 1 case in 500 showed distinct signs of rhachitis, and only 4 had craniotabes as the sole rhachitic sign, fœtal rickets must be a very rare affection.

THERAPEUTICS.

UNDER THE CHARGE OF

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Resaldol.—Dr. Herrmann states that this is a condensation product of resorcin with saloform, the latter in turn being chlormethylene salicylic acid. It occurs as an amorphous, yellow, light powder, which is soluble in water, in the usual weakly acid solutions, but more readily soluble in diluted soda, and particularly in alkaline solutions. Theoretically, on breaking up, it should exhibit the antiseptic properties of salicylic acid with the astringent effects of resorcin, and since it is soluble only in alkalies these effects should be exhibited chiefly in the intestines. The powder is of an astringent taste. Because it is rather difficult to swallow, capsules or wafers are prepared for its administration. The remedy is relatively harmless, for a daily amount of 150 grains produces no untoward symptoms. It seems to be effective when given by enema in amount of fifteen to thirty grains in six ounces of barley water. Since it is not without some influence upon bacteria, the results of its administration to a patient suffering from chemico-infectious diarrhœa is of interest. Three patients suffering from intestinal tuberculosis received benefit. On the other hand, in typhoid fever the results were not positive. The intestinal catarrh of children and chronic catarrh of the large intestine in adults yield to the remedy. For the former three five-grain doses are given daily; for the latter, about fifteen grains thrice daily.—*Therapeutische Monatshefte*, 1900, Heft 4, S. 199.

Ichthoform.—Drs. S. Rabon and B. Galli-Valerio have studied this substance, which is a combination of ichthyol and formaldehyde. Experimentally it is shown to hinder the development of bacterium coli, bacillus typhosus, bacillus icteroides, bacillus pyocyaneus and staphylococcus pyogenes aureus. It is in small quantities an active deodorant; and is, so far as evidence is afforded by frogs and guinea-pigs, non toxic. As an internal antiseptic, thirty to forty-five grains have been administered for several days at a time in various intestinal diseases, with good results; no unpleasant symp-

toms have been observed. Two instances of its use in intestinal tuberculosis did not result in any definite conclusions as to its value. As an external application Rochaz reports excellent results, and even believes that it is a substitute for iodoform.—*Therapeutische Monatshefte*, 1900, Heft 4, S. 202.

[It is quite remarkable that this as well as the preceding remedy is not of demonstrable effect in intestinal tuberculosis. Apparently the intestinal antiseptic of choice will be neither of these.—R W. W.]

The Hypnotic Action of Apomorphine without Nausea.—Dr Charles J. Douglas states that this remedy is a prompt and wellnigh infallible hypnotic when injected subcutaneously in doses of about one-thirtieth of a grain. Although this amount is about the average hypnotic dose, yet for some patients it is too large, as it produces nausea, while in others a larger amount will cause no disagreeable symptoms. The dose should be so adjusted as to be large enough to produce sleep and small enough to avoid nausea. This being only about one-third of the ordinary emetic dose, it is, of course, perfectly harmless. When thus administered it acts with precision. Both in mild insomnia and in furious delirium it produces in from five to twenty-five minutes a sleep which is refreshing and restful. On waking there are none of the unpleasant symptoms which follow sleep when induced by drugs. As its action is so prompt, it is advisable to administer it when the patient is in bed or quite ready for bed. Its direct hypnotic action appears to last from one to two hours, but in many instances the patients will sleep all night. If a saturated solution of boric acid is employed to secure antisepsis the apomorphine becomes entirely inert. There is no danger of forming a drug habit. In addition to its hypnotic action it is also a cardiac stimulant, sudorific and antispasmodic.—*Merck's Archives*, 1900, No. 6, p. 212.

[The suspicion may be entertained that the apomorphine is not always pure. Some preparations, at least, are far from producing hypnotic effects.—R. W. W.]

The Palliative Treatment of Paralysis Agitans.—Dr. R. T. Williamson reports that he has found the following drugs useless: arsenic, quinine, potassium bromide, strychnine, calabar bean, cocaine, cannabis indica, caffeine, atropine, silver nitrate, codeine, gelsemium, cannaosis tannade, butyl chloral, chloral hydrate, potassium iodide and piscidia. Various authors have stated that hypodermatic injections of hyoscine hydrobromate, duboisin sulphate and morphine have yielded good results, but in a disease of such long duration it seems undesirable to make use of this method. The only drug which has proved to be of real service is hyoscine hydrobromide in larger doses than $\frac{1}{100}$ of a grain given in solution in chloroform water. The maximum dose of $\frac{1}{75}$ of a grain two or three times daily by the mouth can be given for long periods without toxic effect, although it is well to watch for symptoms. This not only diminishes the severity of the constant tremor, but it renders the patient more comfortable; it diminishes the general restlessness and uneasiness and the constant desire to change the position, which is such a troublesome symptom of the disease. For sleeplessness a little whiskey and water may be taken at bedtime, or sulphonal may be employed. If this is not successful, a fourth dose of hyoscine and even a larger one may be taken

at night. Life in the open air should be encouraged, and all forms of mental excitement and worry must be avoided. Wine or alcoholic drinks must be forbidden, and only weak tea and coffee should be taken.—*The Practitioner*, 1900, No. 382, p. 407.

[A considerable personal experience with the above method sanctions its indorsement.—R. W. W.]

The Treatment of Delirium Tremens.—Dr. Charles G. Stockton first administered a purgative and later one or two drachms of potassium bromide with thirty grains of chloral or less if the patient is not a robust individual with a strong heart. This may be repeated if necessary, and should the heart fail, digitalis may be given by the mouth or hypodermatically. Later hyoscyamus, camphor or opium may be necessary. Alcohol must be forbidden, and in place a safe, immediate stimulant, as beef-tea with capsicum, freely as a condiment. Diffusible stimulants, like compound spirit of ether, or strychnine, digitalis and nitroglycerin, may also be given. Aloin in half-grain dose, if chemically pure, may be administered hypodermatically, and will produce a full evacuation; even magnesium sulphate may be given in the same way. Hyoscine hydrobromate in one-hundreth of a grain dose can be given subcutaneously and repeated after two hours; this stimulates both circulation and respiration, but it gives relief at a great expense of tissue and disturbance of innervation. The patient is made quiet but is exhausted by the drug, which is, therefore, only permissible when the delirium is only a temporary one.—*The American Therapist*, 1900, No. 9, p. 171.

Phthisis Pulmonalis Treated with Nascent Ammonium Chloride.—Dr. J. C. Ballard considers that in incipient and advanced phthisis that part of the bronchi and air vesicles occupied by the tubercle bacillus is also in a septic condition. Climatic treatment being impracticable, the following is recommended. An inhaler arranged as follows: A glass jar is filled three-fourths full of pure water and alkalized with half a drachm of aquæ ammoniæ. Into this is dropped the selected remedy. A small test-tube is fitted into the rubber cap of the jar; it is filled with sodium chloride and saturated with pure hydrochloric acid. Over this salt vessel is a glass tube arranged so that it fails to touch the saturated salt by one-fourth of an inch; this glass tube curves on itself after emerging from the rubber cap, and re-enters the jar, descending into the ammoniated water. A mouthpiece just penetrating the rubber cap, but not entering the ammoniated water, completes the apparatus. When the patient inhales the air it passes over the saturated sodium chloride, absorbs some of the chlorine gas, and carrying it into the ammoniated water instantly forms nascent ammonium chloride, which, as a dense white vapor, is conveyed to the lungs. This vapor is antiseptic, expectorant, and stimulant. Results are immediate. The patient gains weight and strength. Nights are quieter, sleep is sound. Various remedies may be added to the ammoniated water, *e. g.*: Tr. iodine comp. and acid. carbolic. of each two drachms, glycerin to an ounce; add five drops to inhaler before using. Another formula is: Liquor iodoform (10 per cent.), campho-phenique, of each add ten drops to inhaler before using. Five drops of guaiacol, terebene, menthol, thymol, and spirit of chloroform are also

recommended. The vapor formed is charged with the remedy. The inhaler requires careful daily washing and a renewal of all its contents. Constitutional treatment is not to be neglected; especially are cod-liver oil and nuclein of service. The vapor will not destroy tubercle bacilli, but it lessens their activity and checks their increase, thus enabling nature to destroy them.—*The Therapeutic Gazette*, 1900, vol. xxiv. p. 156.

[Evidently this method is of considerable value if the recurrent pleas for its use be evidence.—R. W. W.]

Antipneumotoxin in Pneumonia.—Dr. Charles B. Canby reports three patients treated with Pane's serum. In one there was an initial left lower lobe pneumonia, treated in the usual way with alcohol, digitalis, and sufficient opium to quiet delirium. Crisis occurred on the eighth day. Two days later, following exposure, a second pneumonia developed on the right side. Patient was delirious; temperature, 104° F.; pulse uncountable; respirations, 56. Three drachms of serum were injected. In three hours the temperature fell 2.5°; diaphoresis was abundant; respirations 40 to the minute; the pulse remained uncountable. Following day, temperature and respiration were normal; pulse 96. The dose of antitoxin was repeated. Rapid recovery followed. Two pneumonias occurring in the same patient—the one treated in the usual way defervesced on the eighth day; the second, treated with serum, defervesced on the second day—suggests that the antitoxin produced a much earlier crisis than the first attack indicated as likely to occur. The second pneumonia was exceptionally severe and seemed likely to terminate fatally. A second patient, following an injection of the serum on the third day of his disease, defervesced on the fourth and progressed rapidly to recovery. A third patient received two and a half drachms of serum on the third day of the disease. The following day, temperature, pulse, and respiration were normal. Two days later she sat up in bed; had a chill followed with temperature of 105° F. Next day a second injection of two and a half drachms was given. Following day the temperature was again normal, and likewise pulse and respiration. Convalescence was uninterrupted. Another similar result is also reported, in which five drachms of the serum were twice injected.—*Maryland Medical Journal*, 1900, vol. xliii. p. 113.

Cacodylic Acid.—Dott. G. Manchetti states that this remedy contains about 53 per cent. of arsenic, and since it is essentially an organic compound it possesses chemical and physiological properties different from those of the common preparations of arsenic. For instance, in sodium cacodylate it is well borne in doses of from one and one-half to three grains when one-thirtieth of arsenic, as Fowler's solution, cannot be taken. He recalls the observed fact that soluble or insoluble mineral arsenic, when introduced under the skin or into the peritoneal cavity, is absorbed by the leucocytes, and thus assimilated as an organic form, can act upon other cells in the organism, particularly upon those of the motor centres. It has been further shown that when the fatal amount of mineral arsenic, when given by the mouth or hypodermatically, has been determined, a hundredth part of this amount is sufficient to cause death if it is brought into direct contact with the nervous

centres. Thus it is that metallic arsenic not modified by the white corpuscles is one hundred times more poisonous than that transported in the blood to the nerve centres after having been assimilated or organified by the leucocytes. Cacodylic acid given by the mouth, if it meets reducing agents in the alimentary tract, may become poisonous. So, also, sodium cacodylate has produced epigastric pain, intestinal disturbance, anorexia, and loss of weight. Even the kidneys, whose permeability it diminishes, may not escape, for not only is the amount of urine diminished, but a temporary albuminuria may appear. The subcutaneous method presents none of these inconveniences, and can be persisted in for long periods of time. The elimination is principally by the kidneys. This substance has been successfully employed in the treatment of incipient pulmonary tuberculosis, in various cutaneous diseases (psoriasis, lichen planus, lupus erythematosis, tuberculosis, and sarcoma), lingual epithelioma, and chorea. The dose varies from one to one and one-half grains of sodium cacodylate, given hypodermatically, up to six grains daily by mouth or rectum.—*Rivista Critica di Clinica Medica*, 1900, No. 14, p. 275.

Dott. A. Bormano remarks that sodium cacodylate increases the number of red blood-globules, and can be employed in anæmia and chlorosis when iron is not well borne. It gives better and more rapidly-attained results, even if the latter is tolerated. In all instances when arsenic is indicated this remedy can be given in much larger doses than it is believed can be useful to the organism.—*Gazzetta degli Ospedali e delle Cliniche*, 1900, No. 39, 415.

[The literature on this subject is practically unanimous, and the advantages of this remedy over other preparations of arsenic are real.—R. W. W.]

The Treatment of Membranous Colitis.—Dr. W. H. Thomson relieves the colonic symptoms by irrigation twice daily with from three to five gallons of normal saline solution at a temperature of 100° F., five drops of oil of peppermint being added to each pint. Sometimes benefit is derived from using at the end of the irrigation a gallon of water, to which sixty to one hundred grains of resorcin have been added, care being that all is expelled afterward. Once a week a pint of clean hot water, with thirty or forty grains of silver nitrate, may be used instead of the resorcin. As a medicinal remedy, which may be of service in changing the disordered nutrition of the intestinal mucous membrane, small doses of castor oil are advised. This is prescribed as an emulsion, of which each dose contains one-half to one drachm of the oil, preferably the former at first, to be taken either half an hour before or an hour after meals. Silver nitrate in quarter-grain doses, combined in pill or capsule with nine grains of resin of turpentine and taken three times daily, is serviceable. The turpentine should be well pulverized with licorice powder and a drop of liquor potassæ added to each capsule. After the silver has been taken for six weeks, copper sulphate in quarter-grain doses may be substituted for it. For the gastric symptoms five grains of resorcin in solution with tincture of nux vomica half an hour after meals, and supplemented with ten grains of sodium benzoate and an equal quantity of sodium salicylate in capsules after each meal, constitutes an excellent intestinal antiseptic. For the constipation one to two drachms of sodium phos-

phate with ten grains of sodium salicylate in a tumblerful of water as hot as the patient can bear it should be given each morning. Daily massage of the bowels is highly recommended. The diet should simply exclude beans, corn, spinach, and the woody vegetables, along with oatmeal. The use of meat, poultry, eggs, fermented milk, and peptonized milk, and most cereals should be encouraged.—*Medical News*, 1900, No. 1429, p. 852.

Treatment of Mucomembranous Enterocolitis.—Dr. G. Lyon first discusses the chronic form in adults. Treatment directed toward an improvement of the general health and neurasthenic tendency is advised. Stress is laid on a dietary that will insure sufficient nutrition, and not leave solid material in the intestine that will irritate mechanically. A strict vegetable diet does not leave a large residue. Milk is often not well borne. Glénard believes that an entire intolerance of milk is an indication of enteroptosis. Its use is advised only in small amounts in the preparation of soups, creams, etc. An exclusive milk diet is indicated only during paroxysmal crises. There follows a most liberal dietary, varying from soups to sweets. Intestinal atony requires constant watching.

The various laxatives cannot be indiscriminately used; drastic purgatives are contraindicated even in very moderate doses. Saline purges are valuable, but their prolonged use results in a constipation still more obdurate. Aloes is condemned for its congestive effect on the rectal mucous membrane. Hemorrhoids, so often complicating colitis, are aggravated by its use. Laxatives found most satisfactory are linseed and psyllium, which act by virtue of their essential oils. These failing, castor oil is preferred in one or two drachm doses in the morning. Following is a useful prescription: Calcined magnesia, washed sulphur, cream of tartar, of each five drachms. Rectal irrigations, variously composed, and glycerin suppositories, are mentioned as sometimes useful. If there be enteroptosis, rest in bed is necessary. Enterocolitis, occasionally due to nephroptosis, has been cured by attention to the latter condition. Ichthyol is highly recommended to reduce congestion in the intestine. It is best given by rectal lavage—one or two drachms in a quart of water. Picric acid is useful in mollifying the changes in the mucous membrane; it is used as an enema, fifteen grains of acid in thirty ounces of water. "Lavage of the intestine" (high rectal irrigations) is beneficial; it removes masses of hardened fecal matter, diminishes pain, spasm of the intestine and consequent retention of membranes, restores to the mucosa its functions of absorption and elimination, and by means of the temperature of the water it increases the contractility of the intestinal wall. The enteroclysis habit is a fact, and it causes great weakening of the patient in time. A hard-rubber tube is inserted into the rectum. The bag containing the irrigation should be raised not more than eighteen inches above level of bed to avoid undue pressure. The patient should lie prone; otherwise the fluid does not penetrate sufficiently into the intestine. Non-irritating antiseptics may be added to the water, such as sodium bicarbonate thirty grains, and sodium salicylate fifteen grains. About one quart of water is sufficient for each irrigation at first; later the amount is increased to three quarts. The patient, lying on the right side, will soon retain one or two pints of fluid, facilitating thus its entrance into the transverse colon. Tempera-

ture of water, 104° F. where great pain or spasm exists; 113° to 118° F. where atony is dominant. Irrigations once a day for a week, and then every second or third day. Injections of oil one pint, *technique* as above, protects the mucosa from scybala. High in the intestine digestion decomposes the oil into glycerin and acids, thus acquiring laxative properties.

An objection is that it requires half an hour to introduce the oil. When irrigations are prescribed, castor oil by mouth should be given also. Warm baths increase the comfort of the patient; if they are weakening, hot compresses on the abdomen are useful. Cold compresses (Priessnitz) may be substituted. Medicinal sedatives are calcic bromide, one-fourth to two drachms. Belladonna is most serviceable. Opium is contraindicated, causing constipation. Complicating gastric disturbance consists in hyperchlorhydria, and is best treated by a diet of eggs, milk, soft meats, also Vichy thrice daily, with sodium sulphate added, a third to one drachm. If there be diminished pepsin production and gas formation, small doses of sodium carbonate are sufficient. Strychnine is useful. A neurasthenic state is best treated by ammonium valerianate. Warm douches (104° F.) act well in erethism. If reaction is good, cold is substituted. In anæmia iron and arsenic are badly borne. Subcutaneous injections of sodium cacodylate (three-fourths of a grain) can be substituted. Paroxysmal painful crises simulate the various forms of colic, and require heat locally with morphine. Patients are very liable to acquire the opium habit. Such crises, due to intestinal spasm, require purgatives and injections to expel the mucomembranous casts. If fever be present, milk diet is indicated; kephyr may be substituted. If diarrhœa intervenes, saline purges are useful, as is also calomel, but it must not be too often repeated. Enterocolitis in the infant: If a nursling, frequency of feedings is diminished. If fed by bottle, sterilized milk is essential. In older children also milk alone is advised. Irrigations sometimes provoke pain early in the disease; they must be given cautiously. Twelve ounces of fluid are sufficient. It is best not to use them at all until baths and fluid diet have diminished the inflammation. Laudanum and antipyrin control undue tenesmus. Malodorous dejections require fractional doses of calomel. If there be dysenteric dejections, ipecac is indicated.—*Revue de Therapeutique*, 1900, Nos. 5 and 6, pp. 115, 181.

GYNECOLOGY.

UNDER THE CHARGE OF

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Correlation of Sexual Function with Insanity and Crime.—In an address on this subject delivered before the British Gynecological Society (*British Gynecological Journal*, 1900, No. 2) DR. MACNAUGHTON-JONES presented the following conclusions: The relation between insanity and dis-

turbances of the sexual function due to pelvic disease must be considered in treating the insane. When such disease is suspected a thorough examination should be made. In investigating criminal acts committed by women with irregularities of menstruation due allowance should be made for their influence on the mental condition. The special dangers of the climacteric as regards the development of melancholia must be remembered. Post-operative insanity is rare and generally transient. Women who have been mentally unbalanced are most liable to become insane after operations on the pelvic organs. If mental disorders are noted at the menstrual periods and climacteric in a given case it is important to note the condition of the sexual organs and to operate if gross lesions are found.

Operations for Prolapsus.—SCHÜCKING (*British Gynecological Journal*, 1900, No. 2) describes an operation for prolapsus which consists in making a transverse incision through the vaginal mucous membrane in front of the cervix, dissecting off flaps and closing the wound vertically. If necessary the cervix may be drawn backward by making a vertical incision in the posterior fornix and uniting the flaps transversely.

THEILHABER thinks that prolapse of the uterus is comparatively rare as compared with that of the vaginal walls. Cystocele is due to relaxation of the anterior vaginal wall, and is practically independent of lesions of the rectovaginal septum. If anterior colporrhaphy is performed at all it should be a radical operation, all the prolapsed portion being removed. Unless this is done, the cystocele will recur, even when the pelvic floor has been thoroughly repaired.

ZIEGENSPECK (*British Gynecological Journal*, 1900, No. 2) claims that prolapse of the uterus is due chiefly to the separation of the levator ani muscles. He dissects off flaps from the posterior vaginal wall until the muscles are seen, and secures them with catgut sutures. The raw surface is then closed with buried catgut, and finally the flaps are united.

Bacteria in the Female Urethra.—SCHENK and AUSTERLITZ (*Prager medicinische Wochenschrift*, 1899, No. 17) examined sixty women, with a view to determining the presence of bacteria in the urethra. In over one-half of the cases saprophytic germs were found similar to those in the vestibule. Pathogenic germs are rare.

SAVOR (*Beiträge z. Geb. und Gynäkologie*, Band ii.) states that in cases of gonorrhœa more bacteria of various kinds are found than in uninfected patients. One hundred and twenty pregnant women were examined, of whom less than 25 per cent. were free from urethral germs. The number diminished after delivery. The practical inference is that in order absolutely to prevent cystitis in these cases it is not sufficient simply to disinfect catheters.

Parotitis Following Ovariotomy.—MALCOLM (*British Medical Journal*, December 16, 1899) reports a case of parotitis which developed on the sixteenth day after operation, the patient recovering promptly after the abscess was opened. He attributes the complication to direct infection from the mouth, a decayed tooth being in contact with the opening of the parotid

duct. Infection is favored by the dorsal position, by the dryness of the mouth due to fever, which also prevents secretion, and finally by the fact that the jaws are not used to any extent when the patient is on liquid diet.

Condition of the Uterus after Transplantation of the Ovaries.—RUBINSTEIN (*St. Petersburger med. Wochenschrift*, 1899, No. 31) conducted a series of experiments in rabbits in order to determine what changes take place in the uterus after transplanting the ovaries. He found that in all the cases in which the ovarian function persisted menstruation recurred regularly, and in several instances pregnancy followed. When, however, the ovaries atrophied, atrophy of the uterus also took place.

He concludes that it is not necessary that any nerve-communication should exist between the uterus and ovaries, the activity of the latter wherever they may be situated being sufficient to maintain the normal uterine function. The ovaries have a trophic function dependent upon the maintenance of their internal secretion; hence, the disturbances noted after castration are of a general character, and are not confined to the uterus.

Relative Frequency of Uterine Neoplasms.—WILLIAMS (*Bristol Medico-Chirurgical Journal*, 1899 No. 12) found that among 13,824 cases of neoplasm in both sexes 2649, or 19.2 per cent., were uterine. In nearly the same number Gurlt noted 29 per cent. Williams records the fact that in 4628 cases of cancer 34 per cent. were uterine; Gurlt makes the proportion 49 per cent. In 2649 cases of uterine neoplasms collected by the writer the proportion of malignant growths was 59.28 per cent. The cause of the frequency of uterine neoplasms is to be sought for in the fact that the uterus is rich in cells of a quasi-embryonic character. As Ribbert has shown, cancer develops by preference in epithelium, which shows a great biological activity.

Castration for Uterine Fibromyoma.—TÈDENAT (*Soc. des Sciences méd. de Montpellier*, February 9, 1900) reports twenty-six cases of oöphorectomy for fibroids, with two deaths. Although in every case the hemorrhages ceased entirely after operation, the writer concludes that it is only palliative, and has abandoned it in favor of hysterectomy.

He calls attention to the unusual amount of pain following this operation, which cannot be satisfactorily explained, since it is not observed in other cases of salpingo-oöphorectomy.

Operation without Preliminary Hæmostasis.—GOUBAROFF (*Annales de Gynecologie et d'Obstetrique*, May, 1900) argues in favor of ligating arteries separately during abdominal operations only after they have been divided. His conclusions are as follows: 1. By this method the topography of neoplasms can be studied more accurately. 2. There is an absence of venous oozing. 3. Secondary hemorrhage is impossible. 4. Pure ligatures are employed, with a correspondingly less risk of infection. 5. When tissues are ligated en masse it is impossible to note pathological details, which can be done most satisfactorily when the vessels are tied separately. 6. Undue tension and compression of the tissues are avoided.

[While the author's contention that ligation of arteries alone is more surgical than ligation en masse is undoubtedly correct, the advantages claimed are not always obtained at the operating-table. There is no reason why the ovarian and uterine arteries should not be isolated and secured in most instances; but in complicated cases it is often impossible to pick up smaller vessels while working deep within the pelvis. The claim that venous bleeding is entirely prevented by ligation of the large arteries is not borne out by experience, since we have seen most annoying venous hemorrhage even after preliminary ligation of both the anterior branches of the internal iliacs.—ED.]

Sclerosis of the Uterus.—RICHELOT (*Ibid.*) claims that this is a distinct pathological condition which should not be placed in the same category with metritis of infective origin, since it may exist in virgins or in women who have never suffered any puerperal lesion. Such a uterus is recognized pathologically by its increased size, extreme hardness, by the hypertrophied endometrium, and large eroded cervix. Microscopically the uterine tissue closely resembles that of a fibroid uterus.

The symptoms in young women are largely neuralgic, and are frequently attributed to cirrhotic or cystic ovaries, but persist after the supposed offending organs have been removed.

The writer concludes that this particular type of uterine disease is met with principally in neurotic and arthritic subjects; hence, he believes that in non-infectious metritis local treatment is more or less useless. He is equally skeptical about the results of intra-uterine medication in most cases of metritis of infectious origin, claiming that the cervix should receive the principal attention.

Torsion of the Fallopian Tube.—POZZI (*Ibid.*) reports three cases of pyo- and hydrosalpinx and one of tubal pregnancy attended with severe attacks of abdominal pain, in one instance simulating appendicitis. Attention is called to the difficulty of distinguishing sudden torsion of an enlarged tube from rupture of an appendicial abscess or of an ectopic sac. Torsion of the pedicle of a small cyst would also give rise to the same symptoms.

Opotherapy.—MOSSE'S monograph on this subject (reviewed in *Annales de Gyn. et d'Obstetrique*, May, 1900) concludes with some practical deductions with regard to the value of opotherapy, which he distinguishes as direct and indirect.

The writer believes that ovarian extract is most useful in relieving preclimacteric disturbances, although it is also indicated in the reflex troubles following the establishment of the menopause. Menstruation that has been prematurely arrested reappears after the use of the drug, but it has no influence in exciting the menstrual flow in young girls who have the nisus without any discharge of blood.

In discussing so-called indirect opotherapy, he states that in cases of amenorrhœa due to anemia iron is preferable to ovarian preparations, while he is confident that they have no value in the treatment of osteomalacia as compared with castration.

Appendicitis in its Relation to Pelvic Diagnosis.—FALK (*Centralblatt für Gynäkologie*, No 7, 1900) reports a number of cases to show the difficulty of diagnosing appendicitis and diseased adnexa. He does not agree with Martin's statement that a history of intestinal disturbances is a strong point in favor of the former affection.

As regards the coexistence of appendicitis and disease of the right tube and ovary, he quotes Martin's statistics to prove that this is less common than is ordinarily supposed (thirteen times in 276 cases of salpingitis). Dührssen found appendicial complications in ten out of 322 abdominal sections, while Ochsner reported fifteen cases of secondary and tubal and ovarian disease in fifty-one cases of appendectomies.

OBSTETRICS.

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Ectopic Gestation; Removal of Embryo, with Preservation of the Tube.—In the *Centralblatt für Gynäkologie*, 1900, No. 22, JUNG reports two very interesting cases of ectopic gestation as follows: The first was that of a woman, aged forty-one years, in whom a tumor was found in the right side behind the uterus. This was undoubtedly connected with the right tube. On opening the anterior wall of the vagina, the hæmatoma was easily drained; the uterus brought down into the wound, and blood-clots sponged away until the right tube could be examined. It was found ruptured in the middle, but the tissues of the tube very little altered at the extremities. After the chorion and blood-clot had been removed a sound was passed into the tube and its lumen found to be intact. The tissue was then brought together with fine catgut. The patient made an uninterrupted recovery.

In the second case the uterus was retroflexed and fixed through adhesions. The left tube seemed normal; the right was thickened and enlarged. The tube seemed to lie behind the uterus. The operation was similar to the preceding. More difficulty was experienced in freeing the parts because of the adhesions. The pelvic viscera seemed embedded in a mass of old blood-clot and adhesions. The tube was opened and found to contain the remnants of an ovum, which was removed. A sound was then passed into the tube, and the two portions brought together upon the sound. Adhesions were loosened cautiously, and the vaginal incision closed. The patient made a good recovery.

[These interesting and very successful operations suggest new possibilities in the treatment of early ectopic gestation. If abdominal incision can be

avoided, if the ovum can be removed and the tube preserved, surgery can show far better results in conservatism.—ED.]

Dystocia from Uterine Fibroids; Hysterectomy; Recovery.—In the *Comptes Rendus de la Société d'Obstétrique, de Gynécologie et de Pœdiatrie de Paris*, 1900, p. 62, LEPAGE reports the case of a woman in her second pregnancy who had lost her first child after a difficult forceps delivery, accompanied by free hemorrhage. During the second pregnancy she suffered from considerable abdominal pain and hemorrhage. Examination revealed a fibroid tumor so situated in the anterior wall of the uterus as to make it probable that delivery would have to be accomplished by abdominal section. The patient declined to enter a hospital. When labor began the fœtus was found high in the uterus, in transverse position, the back in front, and the head upon the right side. A rather soft tumor occupied the lower portion of the anterior uterine wall. Hemorrhage occurred to a considerable extent, so much so that the fœtal life seemed likely to be in danger. Accordingly, abdominal section followed by incision of the uterus was practised, and the child rapidly extracted and resuscitated. In view of the mother's exsanguinated condition, the uterus was brought out through the abdominal wall. Elastic ligatures were applied and the uterus was amputated, some difficulty being found in securing sufficient tissue to make a favorable stump. Several days after the operation the patient had a moderate rise of temperature, when the stump separated. Upon examination, a small pus-pocket was found, and a fistula gradually formed which opened into the vagina. As a result of the thorough antiseptic cleansing, this soon closed. The patient and child subsequently made a good recovery.

Tubal Pregnancy; Rupture with Hydrosalpinx and Twisted Pedicle.—In the *Comptes Rendus de la Société d'Obstétrique, de Gynécologie et de Pœdiatrie de Paris*, 1900, p. 90, BAUDRON describes the case of a patient who had symptoms of ruptured tubal pregnancy, for which the abdomen was opened. Upon operation it was found that the tube upon the left side had contained the ovum, and that it had ruptured in the usual manner. A second tumor presented, the exact nature of which was not at first recognized. On further examination this was found to be a hydrosalpinx of the right tube. Both tubes and ovaries were removed. The patient made a good recovery.

[In these two cases we have pregnancy complicated, first, by a tumor of the womb; and second, a tumor of the Fallopian tube. In both cases interference could not be practised during pregnancy. Each patient was examined with a view of operation, but it was decided to wait and allow the embryo every opportunity to increase its maturity. In the one case, alarming uterine hemorrhage threatened both mother and child, and in the second case, ruptured ectopic pregnancy obliged the operator to proceed. So much is sometimes accomplished by the natural efforts at delivery in cases of pregnancy complicated by fibroids that it is always best to await the action of labor, standing ready to assist at any moment.

Hydrosalpinx may become so large and so complicated by adhesions as to become almost unrecognizable. The writer recalls a case of hydrosalpinx in which the tube unfolded the layers of the broad ligament and became as

large as a small fœtal head. It was not until the tumor had been removed and opened that the correct diagnosis could be made.—ED.]

Antenatal Diagnosis.—In the *British Medical Journal*, 1900, pp. 1458 and 1525, BALLANTYNE contributes a paper upon this subject. He believes that antenatal diagnosis should include the discovery of normal and of plural pregnancy, of fœtal death, of diseases and monstrosities of the fœtus, hydramnios and morbid condition of the placenta. To arrive at an accurate antenatal diagnosis, the medical history of the mother and the history of the performance of the function of the pelvic organs must be carefully noted. The past history and present statement of the father, and the family history on both sides should be taken into account, while the condition of the mother during the pregnancy which is in progress must be carefully investigated. This should be supplemented by a very complete physical examination of the maternal organs, and especially of the abdominal viscera. The maternal urine and blood should also be subjected to examination to complete the investigation. The fœtus should be examined by the hands, by the ear, and by such instruments of precision as are available for this purpose.

Attention is called to the importance of the maternal medical history as regards a disposition to cancer or other serious constitutional disorders. Women who have had disastrous obstetrical histories are often found to have suffered previously from neuroses of various kinds, from tubercle, alcoholism, syphilis, derangements of the kidneys, or rheumatism or gout. The morbid condition in reproduction and in the general health in these cases is probably due to a common cause. This also leads us to infer that the degenerative conditions, such as nervous diseases, insanity, arthritic developments, neoplasms, tuberculous predisposition, and the tendency to take alcohol and other toxic agents to excess, are apparently governed by the same laws as to transmission which preside over malformations, abortions, congenital debility, and other phenomena of antenatal pathology.

As regards the mother's reproductive history, the type of menstruation is of importance, especially in view of the fact that a diseased uterine mucous membrane predisposes to antenatal disease. The conditions as regards marriage are also important, as to whether marriage has occurred at early or late life, or whether those related have married.

The history of previous pregnancies is of great value. Abnormalities in pregnancy and in the fœtus repeat themselves so constantly as to make this a very striking fact. In syphilis the antenatal phenomena diminish in virulence as the reproductive history of the woman progresses, while in alcoholism there is a marked tendency toward intensification. Ballantyne suggests that "repeating abortion" is a better term than "habitual abortion," usually employed.

As regards the paternal history, this is of great importance, especially in the question of age, the use of alcohol, and of other diseases. Attention is called to Sullivan's interesting contribution, which shows that so long as maternal alcoholism exists, abstinence on the part of the father does not much improve the prospects of the unborn child.

Family history is interesting and very suggestive in these cases. The tendency to multiple pregnancy, to monstrosities, and other malformations

remains very distinctly with certain families. Dissimilar heredity is also seen. Thus a parent with a minor malformation may produce offspring having a decided and extensive malformation.

Ballantyne urges that the closest scrutiny be given to the details of the pregnancy in seeking for evidence of fœtal disease. The symptomatology of pregnancy must be normal to prove positively that the fœtus is developing normally. If discharges persist from the vagina resembling menstruation, in the early months this may indicate a threatened abortion or a hydatid mole, or in the later months it may point to a low implantation of the ovum or to premature separation of the after-birth. This condition may also indicate a morbid state of the womb or an ectopic gestation. In other cases there is something abnormal in the feeling of the fœtal movements. Violent movements resembling those of hiccough are sometimes observed, and in rare cases may be attended by abnormal presentations in labor. Abnormalities in the size of the uterus for the period of gestation draw attention to hydramnios, hydatid mole, twins, a monster, or dropsical fœtus.

We must also note symptoms which are present in pregnancy, but which have nothing to do with the pregnancy itself. Thus erysipelas in the mother has been followed by a streptococcus infection of the endocardium in the fœtus. Traumatism also producing injury in the mother may be transmitted to the fœtus. The use of drugs and the commencement or continuance of drunkenness during gestation have a distinct effect upon the child.

In proceeding to study these cases by physical examination it is necessary to make a thorough investigation of the mother aside from the pelvic organs. Congenital anomalies in the mother may suggest the occurrence of such in the child. An acute infection in the mother may influence the child. Fœtal conditions will often make themselves manifest by some abnormality in the mother's general state. Thus fœtal death may be followed by the disappearance of varicosity of veins in the mother and by shrinking of the thyroid gland.

A physical examination of the maternal organs of generation must also be made. Such examination should include the breast, abdomen and pelvic organs. To proceed to a physical examination of the fœtus in utero we examine the abdomen as critically as if we intended to perform an abdominal section. The outlines of the fœtus, its comparative size, a normal or abnormal condition of the amniotic liquid and a careful study of the fœtal heart are all included in this examination. The character of the fœtal heart-sounds may indicate disease or malformation of the fœtal heart, while the absence of the sounds suggests a strong suspicion that the fœtus has ceased to live. Bubbling sounds in the uterus may denote the presence of gas from a dead fœtus. The cephalometer may be employed for fœtal measurements. The graphic representation of fœtal movements enables us to detect variations in these movements, caused by malarial intoxication and other fevers, as in case of typhoid. The difficulties of skiagraphy do not make it likely that this method will be of great use in the study of the fœtus. A further and most interesting field of investigation lies in the blood and excretions of the mother during pregnancy. In this direction there is every reason to believe that much interesting and valuable information may be gained.

During labor it is necessary to diagnosticate abnormalities of the fœtus in

order to determine the necessity for various operative procedures. The hydrocephalic head can be recognized, also the enlarged abdomen of the dropsical child. Abnormalities in the meconium and other discharges may point to malformations in the excretory organs.

The Prevention of Dystocia Due to Fœtal and Pelvic Disproportion.—In the *Medical News*, 1900, p. 1025, AYERS considers this subject at some length. In estimating the probability of dystocia through disproportion, he considers it very necessary to note the physical characteristics of the parents. He believes that the size and consistence of the fœtus can be greatly influenced by the mother's diet, and describes various methods which have given a fair degree of success. In estimating the value of pelvimetry, he calls attention to the fact that external diameters must not be relied upon too implicitly, as large external measurements may be given by heavy bones which encroach more upon the pelvic space than light bones of different outside dimensions.

In determining the necessity for thorough internal examination he believes that the history of previous labors is of decided value. He calls attention to the dangers arising in funnel-shaped pelves, and urges that measurements of the pelvic outlet be more generally taken. While cephalometry is interesting, it has not given such practical results as to establish its universal employment. Physical examination with palpation of the head remains the most available measure. Where dystocia is anticipated we may attempt to prevent it by restricting fœtal growth, by the mother's diet, by inducing labor, or holding ourselves in readiness to perform an appropriate operation should labor not proceed successfully. Induced labor is the most available procedure among the well-to-do, the methods usually employed being the use of the sterile, flexible bougie, a small Barnes bag or the tampon, preceded by the administration of a full dose of castor oil.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Posterior Rhinoscopy.—Every now and then efforts have been made to combine the rhinoscopic mirror and tongue depressor so as to facilitate examination, but thus far they have been failures. DR. E. KRAUS, of Paris (*Annales des Maladies de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1), produces a new combination of mirror and spatula, in which the tongue depressor is smaller than is usually employed, and the lateral edges of which are turned upward so that it can be pressed from one side to the other without irritating the tongue. He claims that it is very efficacious, especially in facilitating operative procedures, and this we can readily believe.

Œsophagoscopy.—At a recent meeting of the Vienna Society of Laryngology (*Annales des Maladies de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1) Dr. Ebstein reported two cases of foreign body in the œsophagus, in which removal was effected through the aid of the œsophagoscope, one patient being an infant, two and one-half years of age, who had swallowed a kreutzer piece, and the other a woman, twenty-three years of age, who had swallowed a fragment of bone.

Dr. Ebstein also presented to the Society a woman, fifty-six years of age, who had about five weeks before swallowed by mistake a solution of potash. Œsophagoscopy revealed at the level of the diaphragm some fibrous deposits upon losses of substance in the mucous membrane. Inflammation having the aspect of very red erosions of the mucous membrane was also observed below the cricoid cartilage.

Stricture of the Œsophagus.—Dr. Arthur G. Minshall reports (*Philadelphia Medical Journal*, 1900, No. 110) a case of tight stricture of the œsophagus of but four months' duration, due to the accidental deglutition of a solution of caustic potash, and cured by a few treatments with electrolysis under a current of 10 milliampères; the internal electrode being a metal olive attached to the negative pole, and the posterior electrode a spongiopiline pad placed over the sternum.

Dr. John S. Pyle, of Toledo (*Ibid.*), reports a case of stricture of the œsophagus resulting from typhoid ulceration, in which he overcame the constriction by passing fine digital silk sacks attached to a male catheter and distending them with water. In the case recorded the appliance gave the greatest satisfaction.

Nasal Polypi.—Instances are occasionally met with in which a great many nasal polypi exist, but the most astounding record we have encountered comes from Dr. H. W. Loeb, of St. Louis, Mo. (*Journal of the American Medical Association*, April 21, 1900), who removed at one sitting 107 polypi, weighing 77 grains, and about the bulk of a two-ounce bottle. These were removed with the electric snare, which enabled him to work with rapidity and without hemorrhage. The subject was a negro man, who had been operated upon for a sarcoma of the orbit, with removal of the left eye.

Gangrene of the Tonsil.—A case of gangrene of the tonsil is reported by Dr. Alexander G. Howe, of Brooklyn (*Philadelphia Medical Journal*, March 17, 1900). The patient was a man, aged twenty-six years, with a peculiar pallor and partial stupor or lethargy from pronounced toxæmia. The case had begun a week before with the symptoms of an unusually severe peritonsillar abscess, and with expectoration, within the last twenty-four hours, of a brownish, foul-smelling discharge. The patient was bathed almost constantly in a profuse perspiration, and had a pulse from 110 to 120. The gums, the inner surface and the under surface of the tongue were greatly swollen and covered with deep excoriations or ulcers. Both tonsils were enlarged into purplish masses, the left one being a large tumor extending beyond the median line nearly to the opposite tonsil and well up into the rhinopharynx. On its anterior surface there was a necrotic spot

one-half inch in diameter, with a perforation through which exuded a dark-brownish, grumous discharge; on its inner surface was a similar spot. On excising the tonsil a dry, stringy or fibrous, gangrenous mass presented at once, indicating that the whole interior was necrosed. A rounded, fetid mass, about the size of a hickory nut, was removed with the forceps, much as a nut could be picked from its shell. The gangrenous process continued the following day, when more necrosed tissue was cut away, and pure nitric acid was applied, which seemed to stop further advance of gangrene, and the patient made a rapid recovery. The soft palate remained drawn considerably to the left side and backward without interfering with deglutition and phonation.

Lingual Tumors.—At a recent meeting of the Laryngological, Rhinological, and Otological Society of Paris, DR. DIDSBURY reported (*Annales des Mal. de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1) a case of large tumors at the base of the tongue in a woman, aged fifty years, which had penetrated so deeply and freely into the larynx as to interfere seriously with respiration. They were removed with the wire snare; of course, with immediate relief to the patient. Histological examination failed to reveal the true nature of the tumors, which were supposed to be non-demonstrably tuberculous.

Tuberculosis of the Larynx.—PROF. G. FERRERI, of Rome, contributes to the *Annales des Mal. de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1, an article upon tuberculosis of the upper air passages, in which he gives reasons for discarding topical treatment with lactic acid and the like, and recurs to the almost abandoned treatment by applications of ethereal solutions of iodoform, applied after scraping away any exuberant tissues with a pocket-shaped scoop, which catches the fragments and prevents them from falling back into the air passages.

Acute Enlargement of the Thyroid Gland.—PROF. ALFRED STENGEL, of Philadelphia, contributes an article on acute enlargements of the thyroid gland, with reports of cases (*University Medical Magazine*, June, 1900), and refers especially to a form occurring in certain kinds of anæmia, especially chlorosis, the degree of enlargement being more pronounced, as a rule, in anæmias following hemorrhage than in chlorosis, and the associated symptoms being likely to render the differential diagnosis from Graves' disease rather difficult in some cases.

In recapitulating his observations the writer calls attention to the facts that sudden enlargements of the normal thyroid gland may occur in consequence of nervous excitements of various sorts; as the result of intoxication and various infections; at the onset or in the course of exophthalmic goitre; and sometimes in cases of ordinary goitre or of malignant disease, and that when the pre-existing disease of the thyroid gland is slight the sudden enlargement may give the case an appearance of an entirely acute disease, the underlying chronic condition being overlooked.

Diabetic Ulcers in the Pharynx and Larynx.—DR. W. FREUDENTHAL, of New York, in a contribution to the fourth volume of Bresgen's mono-

graphs on *Nose, Ear, and Throat Diseases*, narrates a number of cases of his own practice, and divides them into two categories: One malignant, in which treatment is of no service, and death takes place by inanition from inability to swallow food; the other benign, in which the tendency is to recover, and in some instances even without topical treatment. Among the latter cases, however, he narrates one in a man, aged seventy years, almost dying in consequence of his dysphagia, and in whom recovery followed protracted daily treatment with an orthoform emulsion without any internal medication whatever.

Laryngectomy.—Dr. N. Taptas, of Constantinople, reports (*Annales des Mal. de l'Oreille, du Larynx*, etc., vol. xxvi., No. 1) a case of total laryngectomy for sarcoma of the larynx, in which he applied an external artificial larynx of his own device, the details of which are illustrated. The result was very satisfactory, the patient being able to emit sound; but, unfortunately, a recurrence threatened to carry off the patient at no distant date. Meanwhile the patient was able to swallow without any food or saliva penetrating into the tracheal portion of the canula.

Death from Hemorrhage After Excision of Adenoids.—Dr. Richard Sachs, of Hamburg, reports (*Journal of Laryngology, Rhinology, and Otology*, February, 1900) a case in which he excised a pharyngeal tonsil, the size of a walnut, from the pharynx of a boy ten years of age. Severe hemorrhage occurred a few hours later, and the patient died four days after the operation despite all that could be done. During the treatment it was found that the patient was a hæmophile, and had bled some four days six months previously after the removal of a tooth.

Abscess on the Anterior Surface of the Epiglottis.—Dr. Alexander C. Howe, of Brooklyn, reports (*New York Medical Journal*, October 28, 1899) this case in the person of a young male laborer, twenty-four years of age, who gave no other history than that of having been subject to slight sore-throats during cold weather. The tumor was incised and nearly a drachm of foul-smelling yellow pus was discharged, relieving the dyspnœa at once. Probing indicated that the cartilage was somewhat destroyed, though not perforated.

Phonation.—Dr. Onodi refers (*Revue Hebd. de Laryngologie*, etc., August 12; *Journal of the American Medical Association*, September 16, 1899) to a study of a number of monsters and of fœtuses whose skulls had been perforated, but who had used their voices, which confirms the existence in man of an infra-cerebral centre of phonation the same as he had already established for dogs, and in the same spot—that is, between the posterior quadrigeminal tubercles and the domain of the vagus.

Stenosis of the Trachea.—A. Dörner reports (*Philadelphia Medical Journal*, October 21, 1899; *Wien. klin. Wochenschrift*, 12 Jahrg., No. 23) a case of tracheal stenosis, due to pressure of an aortic aneurism, in a female subject. Tracheotomy became necessary, and it was immediately followed

by difficulty in breathing, which was relieved by the passage of a soft catheter down to the bifurcation of the trachea. The patient was unable to breathe if this was removed, so a canula was constructed having a soft rubber extension that reached to the bifurcation. The patient died a little over a year after the tracheotomy from inspiration of blood into the lungs after a slight rupture of the aneurism.

Sarcoma of the Carotid Sheath.—Drs. Scanes Spicer and Stansfield Collier report (*Lancet*, August 5, 1899; *Philadelphia Medical Journal*, August 26, 1899) a case of hoarseness and difficulty of breathing in a man, aged fifty-nine years, with a lump in his neck resembling a mass of enlarged, matted glands, the manipulation of which instantly produced coughing. Laryngoscopic inspection revealed the left vocal band to be motionless in the cadaveric condition. At the operation the growth appeared to be limited to the carotid sheath, and surrounded the contained structures. Ligatures were placed upon the internal jugular vein and the carotid, and these vessels, with the pneumogastric nerve, were divided on the thoracic side of the tumor. The growth was readily separated from the surrounding structures, the artery and vein were next ligated at the level of the hyoid bone, and the tumor, with the involved structures, was removed. Until the cephalic side of the growth was interfered with there was no respiratory disturbances, and then breathing became shallow and infrequent, and respiration ceased as the vagus nerve was being isolated. Artificial respiration was resorted to for two minutes. The patient was much collapsed at the close of the operation, but he rallied and made an uneventful recovery.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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On the Source of the Fibrin and the Origin of the Adhesions in Acute Adhesive Inflammation of Serous Surfaces.—Heinz (*Virchow's Archiv*, 1900, clx., 365) discusses the more or less diametrically opposed views held at present in regard to the source of the fibrin on serous surfaces, and offers in favor of one of them the results of a very careful study of experimental lesions produced in rabbits.

Naumann and Grawitz believe that the fibrinous layer arises from a swelling and fibrinoid degeneration of the upper surface of the serosa, while Marchand and Ziegler teach that it is due to a fibrinous coagulation of an

exudation of plasma from the superficial bloodvessels. The first view is based on the following grounds:

1. If the fibrin membrane arises from a fibrinous exudation from the vessels, then the serosa epithelium should be beneath it. Some writers claim, on the one hand, that it has disappeared from beneath the membrane, while Neumann describes cases in which the outer surface of the fibrin layer was covered with serosa epithelium—a condition to be explained, he thinks, only by assuming a fibrinoid degeneration of the serosa tissue.

2. Special stains (picrocarmin), according to Neumann, show transitions of connective tissue into fibrin.

3. A fibrin membrane arising from a fibrinous exudation should contain besides fibres and network of fibrin only leucocytes and possibly red blood globules. But, according to Grawitz, fresh examination of the membrane shows also serosa epithelium and connective-tisue cells, the latter of which, according to him, could be found only in fibrinoid degenerated connective tissue.

In order to excite a fibrinous exudation in serous cavities Heinz injected a solution of iodine in iodide of sodium into the pleural and peritoneal cavities of rabbits, and studied the lesions produced after various intervals of time. His results are as follows:

In the pleural cavity a definite layer of fibrin due to exudation of plasma from the vessels is formed by coagulation on the surface of the serosa, from which it is very sharply marked off.

The pleural epithelium is usually destroyed by the action of the iodine, but in places it is left intact beneath the fibrin on the surface of the serosa; less often small patches of epithelium have been lifted off by the exudation and lie on top of the fibrin.

The exudation in passing from the vessels in the lung to the pleural cavity may coagulate in the tissues (impregnate them), and thus give rise to an apparent fibrinoid degeneration of the connective tissue.

Occasionally bits of connective and elastic tissue can be found in the fibrin membrane. Examination of the pleural exudation and of the lung show that they are due to the iodine, causing in places a superficial loss of substance, which later is followed by active repair.

The injection of iodine into the peritoneal cavity causes an exudation of fibrin and extensive adhesions of the intestines. The fibrin is most abundant along the lines of contact of the coils of intestine. Beneath the fibrin the serosa tissue presents a peculiar hyaline appearance, which is considered by Borst to be due to fibrinoid degeneration, but is held by Ziegler and the writer to be due to hyaline degeneration.

The coils of intestine are stuck together first by fibrin, later by connective tissue. The serosa epithelium (endothelium) protects serous surfaces from adhesions; the latter form only where the endothelium has been destroyed.

Tumors of the Dura Mater.—ENGERT (*Virchow's Archiv*, 1900, clx., 19) suggests a common histogenesis of all psammomata from the superficial endothelium of the dura mater. He examined the inner surface of the dura at autopsy for the presence of tumors, with a positive result in every fifth or sixth case. In this way he collected twenty-five tumors. They appeared to

occur most frequently in the region of the convexity of the brain, varying in size from a pin-head to a bean.

In structure they varied from fibromata to very cellular sarcoma-like forms. The calcifications he attributes to a grouping of the cells about the bloodvessels and subsequent calcification. To explain cases where no remains of the bloodvessels are found in the centre of the calcification he suggests that it may have been formed about the bud of a vessel which has not yet developed a lumen. In support of his views, however, he gives very little histological evidence.

The Finer Changes in the Walls of Varicose Veins.—JANNI (*Archiv für klinische Chirurgie*, 1900, lxi., 12) observed not only degenerative changes brought about by the distention of the veins, but also a new formation of connective tissue which was sometimes quite marked. This new growth of connective tissue occurred chiefly in the intima, giving rise to an endophlebitis characterized by the formation of nodules or flat areas of thickening.

In these endophlebitic growths there was a breaking down of the internal limiting membrane into thinner elastic sheets and fibres. This destruction of the inner elastic limiting membrane is easily demonstrable, and is associated, particularly in the large nodules, with a new formation of elastic tissue which is sometimes abundant.

In the inner portion of the media there was often a new formation of connective tissue limited to those places where the nodules or plates had formed.

Janni asserts that the endophlebitis is the primary change in the vessel wall. He does not regard it as compensatory in character, as Epstein maintains.

Psammoma.—VIRCHOW (*Virchow's Archiv*, 1900, clx., 32) calls attention to the confusion that has arisen in the use of the term psammoma since his introduction of the word in 1863. His classification of the diseases of the brain associated with "sand-formation" he believes is still sufficiently clear to prevent misunderstanding. Quoting from his original description, he says: "Only those tumors in which the sand-like masses are analogous to those occurring normally in the brains of adults are included. Among these one may distinguish two classes. The sand is either in the interior of connective-tissue bundles or it lies more loosely in and between the parts, so that the individual granules may be isolated easily."

He distinctly excluded the calcified endotheliomata and other processes associated with calcification, to which the term has been so frequently applied.

A Contribution to our Knowledge of the Etiology of Tumors.—SCHÜLLER (*Centralblatt für Bakteriologie*, 1900, xxvii., 511).

The article is preliminary to a more detailed report, with illustrations shortly to appear.

The author within the past five months has examined numerous carcinomata and sarcomata taken from various parts of the body, and claims to have demonstrated in every case an organism which he believes to be con-

cerned in the etiology of tumors. These organisms in cultures he describes as round or oval vesicular bodies, when fully developed three or four times the size of a red blood-corpuscle. They consist of a thick refractive capsule with dark-brown contents. The capsule has a radiating, striated appearance, which the writer believes is due to "small openings" or "pores." The organism in culture varies in size, the smaller being the younger forms. It may occur singly or in groups or heaps. In places the contents can be seen escaping from the capsule, and clumps of empty capsules are frequently found. In living hanging-drop preparations flagella-like processes are distinctly recognized. In dead preparations these are withdrawn. The organism is never motile. All these forms can be demonstrated in the fresh tissue. Stained specimens are of little value. A small bit of tissue preserved in alcohol is teased out in absolute alcohol on a slide and cleared with lavender oil. The organisms are frequently found in masses, and are easily recognizable on account of their color and form. Sometimes they occur between the cells, sometimes within cells, often distending them greatly.

Cultures are made from rapidly growing portions of the tumor and never from degenerated areas. Cultures taken from tumors with superficial ulceration are as a rule unsuccessful. Washing the excised tissue in corrosive sublimate has a bad effect. The tumor tissue itself is used as a culture media, though the author is not satisfied with this method. The tissue is put in a sterile glass vessel and kept in the dark at body temperature.

In successful cultures within a few days small pearl, gray or yellowish translucent droplets appear which microscopically are seen to be composed of these organisms.

The author has made some animal inoculations, but not enough time has yet elapsed to complete these observations.

[This report is in line with many others on the subject of the etiology of carcinoma. The writer finds something which he cannot explain, immediately jumps to the conclusion that it is the cause of carcinoma, and rushes into print without waiting until experimentation has proved the truth or falsity of his conclusions. The only excuse for reviewing such an article is that it may contain a grain of truth.—ED.]

A New Stain for Neuroglia Fibres.—YAMAGIWA (*Virchow's Archiv*, 1900, clx., 358) gives the following method, based on Stroebe's stain for axis-cylinders:

1. Harden very thin pieces of fresh tissue in Müller's fluid for about one month, changing the solution daily during the first week.
2. Transfer directly to absolute alcohol for several days to a week.
3. Embed in celloidin.
4. Stain the sections in a saturated alcoholic solution of eosin for twelve hours or longer.
5. Transfer to a concentrated aqueous solution of aniline blue for four to six hours.
6. Differentiate in dilute alcohol made slightly alkaline by the addition of a few drops of a 1 per cent. solution of caustic potash. (The deep-blue sections become at once or gradually reddish-brown, according to the alkalinity of the alcohol.)

7. Wash out the alkaline alcohol in water.
8. Remove the excess of aniline blue in dilute alcohol. (The sections show a reddish color.)
9. Dehydrate in absolute alcohol.
10. Clear in oleum origani cretici.
11. Xylol balsam.

The axis-cylinders stain deep blue, the neuroglia fibres and the red blood-globules dark red, myelin sheaths light red, the protoplasm of neuroglia cells pale violet or bluish-red, the cell body of the ganglion cells pale bluish-gray, connective tissue fibres, adventitia, and the intima of bloodvessels sky blue to pale green, the nuclear membrane of all cells blue, the nucleoli deep violet to deep blue.

The method succeeds only with fresh tissue cut into very thin slices and properly hardened. Tissue left in alcohol too long refuses to hold the eosin stain.

Yamagiwa concludes from the study of his sections that the neuroglia cells in the developed nervous system offer points of support for the neuroglia fibres which are nothing else than the differentiated, peripheral parts of the neuroglia cells whose cell body is not sharply circumscribed by a special membrane; in other words, the neuroglia fibres represent a differentiated intercellular substance, which, however, is not entirely or not everywhere separated from the cells.

A Method of Staining Gonococci.—HOMBERGER (*Centralblatt für Bakteriologie*, 1900, xxvii., 533).

A preparation of gonorrhœal pus stained with kresylecht-violet, in an aqueous solution of 1 to 10,000, stains the nuclei a weak blue, and the gonococci red violet. Other bacteria stain only lightly or not at all.

For staining the organism in sections the author uses a 1 per cent. solution, stains a few minutes, transfers to alcohol, then to aniline-oil-xylol 2 to 1. Kresylecht-violet is very slightly soluble in alcohol, so that there is little danger of decolorizing too much. He also recommends this stain for amyloid, mast cells, blood, and the plasmodia of malaria.

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CONTENTS.

ORIGINAL COMMUNICATIONS.

PAGE

Primary Splenomegaly—Endothelial Hyperplasia of the Spleen—Two Cases in Children—Autopsy and Morphological Examination in One. By David Bovaird, Jr., M.D. 377

Primary Echinococcus Cysts of the Pleura. Report of a Case of Primary Exogenous Echinococcus Cysts of the Pleura, Showing Hyaline Degeneration of the Cuticle without Lamellation, with Notes from the Literature. By Charles Cary, M.D., and Irving P. Lyon, M.D. 402

Sarcoma and Cirrhosis of the Liver. By W. W. Ford, M.D., D.P.H. . . . 413

Report of a Case of Melæna Neonatorum due Apparently to an Infection by the Bacillus Pyocyaneus. By William R. Nicholson, Jr., Ph.B., M.D. . . 417

Distortion of the Aorta in Pott's Disease. By Thomas Dwight, M.D., LL.D. . 429

The Value of Pedicled Flaps in Injuries of the Hand. By W. E Schroeder, M.D. 435

Internal Hydrocephalus Following Cerebro-spinal Meningitis. By Elliott P. Joslin, M.D. 444

A Critical Summary of the Literature on the Diagnostic and Therapeutic Value of Lumbar Puncture. By Alfred Hand, Jr., M.D. 463

REVIEWS.

The Treatment of Fractures. By Charles Locke Scudder, M.D. 470

Fractures. By Carl Beck, M.D. 470

A Manual of Obstetrics. By A. F. A. King, A.M., M.D. 473

Hand book of Optics, for Students of Ophthalmology. By William Norwood Suter, B.A., M D. 474

Refraction and How to Refract. By James Thorington, A.M., M.D. . . . 474

The Refraction of the Eye. By A. Edward Davis, A.M , M.D. 475

A Manual of the Diagnosis and Treatment of the Diseases of the Eye. By Edward Jackson, A.M., M.D. 475

A Text-book of the Diseases of Women. By Charles B. Penrose, M.D., Ph.D. . 476

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

	PAGE		PAGE
Arteritis in Relation to Enteric Fever	477	A Report of 28 Cases of Suppurative Hepatitis	479
Typhoid Fever in Royal Victoria Hospital, Montreal, during 1899 . .	478	Pericarditic Pseudocirrhosis of Liver	480

SURGERY.

Fractures of the Neck of the Radius	481	Surgery in Presence of Sugar in Urine	483
Cancer of the Breast	482	Early Operation in Perityphlitis .	483

PEDIATRICS.

	PAGE		PAGE
Tuberculosis of the Genital Tract in Children	485	Typhoid Fever and Appendicitis	486
		Vaccinal Immunity in the New-born	486

THERAPEUTICS.

Gout and Rheumatism: Etiology and Dietetic Treatment	487	Expulsion of Gallstones by the Use of Sulphur Water	490
Observations and Suggestions Concerning Hypodermoclysis	489	Hyoscine	491
Hepatic Engorgements	489	A Practical Method of Administering Trional to the Insane	491
Diabetes Mellitus and its Treatment	490	The Treatment of Alcoholism	491

GYNECOLOGY.

Palliative Operation for Inoperable Carcinoma Uteri	492	Obesity as a Cause of Sterility	493
Specific Micro-organisms in the Female Urethra	492	Metrorrhagia in Young Girls	494
Steam in Treatment of Endometritis	493	Calcareous Deposit in the Tube	494
Torsion of the Fallopian Tube	493	Pneumonia after Gynecological Operations	494
		Hysteropexy in a Child	494

OBSTETRICS.

The Treatment of Tumors Complicating Pregnancy	495	Puerperal Eclampsia Treated by Hypodermoclysis, with Diuretic Infusions	497
Indications for Premature Delivery with Reference to Eclampsia	496	The Frequency and Significance of Infarcts of the Placenta	497
Gangrene of the Puerperal Uterus	496		

DERMATOLOGY.

Urticaria	498	An Epidemic of Impetigo Contagiosa	499
Dermatitis Venenata due to the Common Ivy	498	Pemphigus of the New-born	499
Mycosis Fungoides	498	Gelatin Applications	499
		A Cream of Carbonate of Zinc	499

PATHOLOGY AND BACTERIOLOGY.

Elastic Tissue in the Uterus and the Ovary	500	Squamous-celled Carcinomatous Degeneration of Ovarian Dermoid Cyst	502